UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

August 1, 2003

Greg Yuncevich
Field Manager
Cottonwood Field Office
Route 3, Box 181
Cottonwood, Idaho 83522-9498

RE: Endangered Species Act Section 7 Consultation: Final Biological Opinion and Magnuson-Stevens Act Essential Fish Habitat Consultation for the 2003 Bureau of Land Management Noxious Weed Control Program for the Cottonwood Resource Area (1 Project)

Dear Mr. Yuncevich,

This document transmits the NOAA's National Marine Fisheries Service (NOAA Fisheries) biological opinion (Opinion) for the Bureau of Land Management (BLM) 2003 Noxious Weed Control Program for the Cottonwood Resource Area. The Opinion is based on NOAA Fisheries' review of the proposed project and its effects on Snake River steelhead (*Oncorhynchus mykiss*), fall chinook salmon (*Oncorhynchus tshawytscha*), and spring/summer chinook salmon and their habitat in accordance with the Endangered Species Act (ESA). The Opinion also evaluates the project's effects on Essential Fish Habitat (EFH) for coho (*Oncorhynchus kisutch*) chinook salmon, in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Formal ESA consultation is conducted under the authority of section 7(a)(2) of the ESA and its implementing regulations, 50 CFR Part 402. EFH consultation is conducted under the authority of section 305 (b)(2) of the MSA and its implementing regulations, 50 CFR Part 600.

The BLM determined in the February 19, 2003, biological assessment (BA) for the noxious weed control project that the proposed actions were likely to adversely affect listed Snake River steelhead and chinook salmon, and likely to adversely affect EFH for chinook and coho salmon. This Opinion is based on information in the BA provided by the BLM, and on literature cited in the Opinion. The enclosed document includes analysis supporting NOAA Fisheries' section 7 determination, an incidental take statement, and EFH consultation for the proposed actions.

Pursuant to ESA consultation, NOAA Fisheries concludes that the proposed project is not likely to jeopardize the continued existence of Snake River salmon or steelhead and not likely to destroy or adversely modify designated critical habitat. Please note that this Opinion includes Reasonable and Prudent Measures to avoid or minimize take, and mandatory Terms and Conditions to implement those measures.

Pursuant to EFH consultation, NOAA Fisheries concludes that the proposed project may adversely affect EFH for chinook and coho salmon. NOAA Fisheries is required to provide EFH Conservation Recommendations for any Federal or state agency action that would adversely affect EFH (section 305(b)(4)(a) of the MSA). The conservation measures proposed for the project by the BLM, all Conservation Recommendations, and all of the Reasonable and Prudent Measures and Terms and Conditions contained in the ESA sections of the Opinion are applicable to EFH, and are thus incorporated as Conservation Recommendations for EFH.

Please note that MSA section 305(b) and 50 CFR 600.920(j) require the BLM to provide a written response to NOAA Fisheries after receiving EFH Conservation Recommendations within 30 days of its receipt of this letter. This response must include a description of measures proposed by the agency to avoid, minimize, mitigate, or offset the adverse impacts of the activity on EFH. If the response is inconsistent with a Conservation Recommendation from NOAA Fisheries, the agency must explain its reasons for not following the recommendation.

If you have any questions, please contact Bob Ries at (208) 882-6148 or Dale Brege at (208) 983-3859.

Sincerely,

for Michael R Crouse

D. Robert Lohn
Regional Administrator

Enclosure

cc: J. Foss - FWS
J. Hansen - IDFG
R. Eichsteadt -NPT

Endangered Species Act
Section 7 Consultation Biological Opinion
and
Magnuson-Stevens Act
Essential Fish Habitat Consultation

2003 Bureau of Land Management Noxious Weed Control Program in the Snake, Salmon and Clearwater River Drainages

Idaho, Clearwater, Lewis, and Nez Perce Counties, Idaho

Agency: Bureau of Land Management, Cottonwood Resource Area

Consultation Conducted By: NOAA's National Marine Fisheries Service (NOAA Fisheries), Northwest Region (NWR)

Date Issued: 8/1/03

Issued by: for Michael R Crouse

D. Robert Lohn
Regional Administrator

Refer to: 2003/00155

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I. INTRODUCTION

The Endangered Species Act (ESA) of 1973 (16 USC 1531-1544), as amended, establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with U.S. Fish and Wildlife Service (USFWS) and NOAA's National Marine Fisheries Service (NOAA Fisheries), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitats. This biological opinion (Opinion) is the product of an interagency consultation pursuant to section 7(a)(2) of the ESA and implementing regulations found at 50 CFR 402.

The analysis also fulfills the essential fish habitat (EFH) requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2)).

The Bureau of Land Management (BLM), Cottonwood Field Office (CFO) proposes to continue in 2003 an on-going program to eradicate noxious weeds (exotic plants that spread and displace native species, and are declared "noxious" by law) across the Cottonwood Resource Area. Proposed weed eradication would occur through physical removal, regulatory restrictions, and biological and chemical controls. The proposed action is similar to weed control activities conducted in 2002 and previous years, with the addition of several new herbicides. The purpose of the noxious weed treatments is to stop or slow the spread of noxious weeds and eradicate established infestations. The administrative record for this consultation is on file at the Idaho Habitat Branch office.

A. Background and Consultation History

The proposed project was discussed by the North-Central Idaho Level 1 Team (consultation team consisting of biologists from the Nez Perce and Clearwater National Forests, USFWS, and NOAA Fisheries) at meetings in Grangeville, Idaho, on November 5, 2002, and January 7, 2003. The CFO submitted to NOAA Fisheries draft biological assessments (BAs) on January 7, 2003, and February 9, 2003. NOAA Fisheries reviewed the draft BAs, and provided comments to the CFO. On January 7, 2003, the Level 1 Team, reached preliminary effects determinations for Snake River spring/summer and fall chinook salmon (*Onchorynchus tshawytscha*), Snake River steelhead (*O. mykiss*), designated critical habitat, and EFH. The Level 1 Team determined that the 2003 noxious weed control program was "likely to adversely affect" steelhead and spring/summer chinook salmon, and "not likely to adversely affect" fall chinook salmon and designated critical habitat for spring/summer and fall chinook salmon. The Level 1 Team also agreed that the weed program would not adversely affect EFH for chinook and coho salmon.

Based on the preliminary Level 1 determinations, the CFO determined in their BA that the proposed action would not adversely affect EFH or critical habitat for spring/summer chinook salmon, since the adverse effects are due to toxicological effects of the herbicides on fish and their prey, rather than physical habitat modifications. NOAA Fisheries concurs with this characterization of herbicide effects, however, chemical contamination is considered by NOAA Fisheries to be an adverse environmental effect. Although the Level 1 Team and the CFO determined that the proposed action is "not likely to adversely affect"critical habitat for spring/summer chinook salmon and would not adversely affect EFH, this Opinion and EFH Analysis evaluate the effects of the proposed action on critical habitat and EFH, respectively, to ensure that the proposed action fully complies with the ESA and MSA.

The CFO requested formal ESA consultation with NOAA Fisheries on the effects of the 2003 weed program on Snake River steelhead and spring/summer chinook salmon, and concurrence with the "not likely to adversely affect" determinations for effects of the weed program on Snake River fall chinook salmon, and critical habitat for spring/summer and fall chinook salmon, through a letter dated February 19, 2003, and the enclosed Biological Assessment (BA). The letter and BA were received by NOAA Fisheries on February 21, 2003, and consultation was initiated on this date. The MSA consultation was not requested by the CFO since they determined that the action would not adversely affect EFH.

Because the effects of the weed program vary at different locations due to the amount and type of chemicals used and fish presence or absence at each site, the BA provided effects determinations for the weed program as a whole, and separately for each watershed in the action area, as delineated by U.S. Geological Survey 6th field hydrologic unit codes (HUCs). The effects analysis at the 6th field HUC scale was provided by the CFO as ancillary information to discriminate among locations where fine-scale determinations are "no effect,""not likely to adversely affect," or "likely to adversely affect" listed salmon or steelhead. This Opinion considers the different effects among the watersheds, but the determinations of effect are made for the project as a whole. The CFO did not request NOAA Fisheries to make separate determinations for each of the 6th field HUCs.

This Opinion considers the potential effects of the proposed action on Snake River spring/summer and fall chinook salmon, and Snake River steelhead, which occur throughout the area where weed control activities would be conducted. Snake River chinook salmon were listed as threatened under the ESA on April 22, 1992, (57 FR 14653), and critical habitat was designated on December 28, 1993, (58 FR 68543) and further refined October 25, 1999, (64 FR 57399). Snake River steelhead were listed as threatened August 18, 1997, (62 FR 43937). The objective of this Opinion, under the ESA, is to determine whether the proposed action is likely to jeopardize the continued existence of Snake River spring/summer chinook salmon or steelhead, or destroy or adversely modify critical habitat for spring/summer chinook salmon. This consultation is conducted pursuant to section 7(a)(2) of the ESA and its implementing regulations (50 CFR 402).

NOAA Fisheries concurs with the CFO determinations that the proposed 2003 weed control activities are not likely to adversely affect Snake River fall chinook salmon or their critical habitat. The CFO determined that Snake River fall chinook salmon would not be exposed to herbicide concentrations where adverse effects would occur since fall chinook salmon occur only in the mainstems of the Snake and Salmon Rivers, where the distance from the herbicide application areas and dilution of the herbicides would preclude any adverse effects. This Opinion does not include analyses or determinations for fall chinook salmon and their critical habitat.

The Cottonwood BLM weed treatment project would likely affect tribal trust resources. Because the action is likely to affect tribal trust resources, NOAA Fisheries contacted the Nez Perce Tribe pursuant to the Secretarial Order (June 5, 1997). The Nez Perce Tribe responded by saying that large infestations of noxious weeds can have detrimental effects on native plants traditionally used by the Nez Perce Tribe, and that weed control efforts could have positive benefits for native plant populations (Personal communication, Rick Eichstaedt, Nez Perce Tribe to Bob Ries, NOAA Fisheries).

B. Proposed Action

Proposed actions are defined by NOAA Fisheries regulations (50 CFR 402.02) as “all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas.” Additionally, U.S. Code (16 U.S.C. 1855(b)(2)) further defines a Federal action as “any action authorized, funded, or undertaken or proposed to be authorized, funded, or undertaken by a Federal agency.” Because the CFO will carry out the proposed action, a Federal nexus exists for interagency consultation under the ESA section 7(a)(2). The weed treatments would occur on BLM lands in the Cottonwood Resource Area, which include tributaries to the Lower Snake River HUC 17060703, Lower Salmon River (17060209), Clearwater River (17060306), and the South Fork Clearwater River (17060305). The duration of the action is the 2003 field season, which begins on the signature date of this Opinion, and ends no later than January 31, 2004.

The CFO proposes to use a variety of weed control techniques, depending on the weed species, weed distribution, and other local factors. Weeds would be killed primarily by treatment with herbicides, and to a lesser extent, by physical removal, and biological control agents (insects or pathogens). Certain regulatory restrictions would also be used to prevent or reduce the spread of weeds by people using BLM lands. The proposed action, described fully in the February 19, 2003, BA, includes numerous techniques and constraints to prevent or minimize alteration of desirable riparian vegetation, and to help keep harmful chemicals out of the water.

Precautionary measures for herbicide use (described in section B.2., below) include no-spray buffers, limitations on application methods and application rates, timing of application to avoid sensitive life stages of listed fish, and specification of certain chemical formulations that have a relatively lower risk than similar chemicals used for the same purpose. These precautionary measures in the BA are intended to reduce the risk of harmful effects to listed fish and other non-target species.

Approximately 1,930 acres are proposed for weed treatment in 2003. Proposed weed treatments include 1,064 acres of aerial herbicide treatment and 866 acres of ground-based herbicide treatment (Table 1), physical removal of weeds (2 to 5 acres), restrictions on use of BLM lands (vehicle closures, weed-free hay, etc.), and release of insects or pathogens for biological control at five sites. Seeding and mechanical treatment (soil scarification, plowing, etc.) would also occur in conjunction with application of herbicides to restore sites addressed in previous consultations (e.g. China Garden Ranch and American Bar rehabilitation project). All noxious weed control measures would be conducted in accordance with standards and project-specific requirements described in Appendix D of the BA, and summarized in section B.2. in this Opinion. Weed control activities may occasionally be used in conjunction with prescribed fire; however, prescribed fire is not part of the proposed action.

The BLM would determine the specific treatment (method, application rate, and timing of application) for each given location based on site-specific considerations such as: (1) Physical growth characteristics of target weeds (rhizomatous vs. tap-rooted, etc.); (2) seed longevity and germination; (3) infestation size; (4) relationship of the site to other infestations; (5) relationship of the site to listed and/or proposed species; (6) distance to surface water; (7) equipment access to site; (8) type and amount of human use of the area; (9) effectiveness of treatment on the target weed; and (10) cost. Depending on these various factors, one or more treatment methods may be used. Each control method is described below, following Table 1.

Table 1. Acreage of aerial and ground-based herbicide application by subbasin.

	Acres Treated in Subbasin					
Method of Application	**Lower Snake**	**Lower Salmon**	**Little Salmon**	**Clearwater**	**South Fork Clearwater**	**Total Acres**
Aerial	122	826	116	0	0	1,064
Ground-based	383	337	51	45	50	866

1. Treatment Methods

a. Mechanical Control

Mechanical weed control includes the use of hand-operated power tools and simple hand tools to cut, clear, mow, or prune herbaceous and woody species. In manual treatments, workers cut plants above ground level; pull, grub, or dig out plant root systems to prevent subsequent sprouting and regrowth; scalp at ground level or remove competing plants around desired vegetation; or place mulch around desired vegetation to limit the growth of competing vegetation. Mechanical control activities for noxious weeds include the use of wheeled tractors, crawler-type tractors, or specially designed vehicles with attached implements for mechanical vegetation treatments (e.g. plows, harrow, rangeland drill). Mechanical control activities typically would occur on old agricultural areas or livestock feeding sites with moderate slopes (less than 20%). All mechanical control activities will include associated rehabilitation measures including seeding and planting of desirable species.

b. Biological Weed Control

Biological control treatments include the use of insect (beetle) parasites or predators that are host-specific to certain noxious weeds. This activity includes the collection of insects, and supplemental stocking of populations. The use of biological control agents follow BLM procedures in the *Use of Biological Control Agents of Pests on Public Lands* (BLM 1990). Approximately five sites would be treated by release of insects.

c. Regulatory Control

Regulatory control methods would involve restrictions on the use of BLM lands and required practices to prevent or minimize the spread of weeds by people who use BLM lands. Regulatory control measures include requirements to:

- Clean all ground surface disturbing equipment moving into or out of weed infested areas before and after use.

- Use only certified, noxious weed-free grains, hay, or pellets for feeding domestic animals and wildlife; inspect all feeding sites during and following use.

- Use only certified noxious weed-free seed, along with hay, straw, or mulch, or other vegetation material for site stability and revegetation projects.

- Use only noxious weed-free gravel and fill material from inspected sites.

- Revegetate disturbed areas as soon as practical; use temporary fencing when necessary to assure new seedling establishment.

- Evaluate current and proposed vegetation management practices (i.e. livestock grazing, prescribed burning, and seeding), and implement practices to restore desired plant communities.

- Close areas to vehicle access if vehicles are the primary cause of introduction and/or spread.

d. Chemical Control - Herbicide Use

The 2003 weed control program proposes the use of products containing picloram; 2,4-D; glyphosate; clopyralid; sulfometuron-methyl, imazapic, dicamba, and metsulfuron-methyl, with water as the only carrier used (Table 2). The herbicides may be applied in spot applications with a mixture that includes one or more of the following surfactants: (1) M - 90; (2) Crop Oil - M; (3) Preference; and (4) metholated seed oil (for use on a 5 acre Plateau trial). Use of surfactants will be in accordance with herbicide label instructions. The BA provides an in depth summary of the proposed herbicide treatments that will occur in each subbasin and 6th code HUC.

(1) Ground-based herbicide application. Proposed ground-based herbicide treatments include use of booms or individual spray nozzles mounted on trucks or all terrain vehicles, hand-pump spraying, hand-spreading granular formulations, wicking, wiping, dripping, painting, or injecting target weeds. Ground-based application methods are typically used to treat small or sensitive areas, such as road right-of-ways, recreation sites, and riparian areas.

(2) Aerial herbicide application. Aerial application (helicopter) is commonly used to treat larger infested areas, which occur in remote rugged terrain commonly found in canyon grasslands. Helicopter application will use paper markers to indicate spray strips and areas sprayed. Sensitive areas to be avoided (i.e. buffers) will be marked with bright-colored ribbon on the ground.

Table 2. Summary of herbicides proposed for use in 2003, in each subbasin.

Herbicide Name	Active Ingredient (AI)	Application Rate (1bs. AI/Acre)	Acres in Each Subbasin				
			Lower Snake	Lower Salmon	Little Salmon	Clear-water[2]	South Fork Clearwater
Tordon/2,4-D	Picloram/2,4-D	0.25 & 1.0	153	769	156	27	40
Rodeo	Glyphosate	1.5	71	70	4	3	2
Transline	Clopyralid	0.3	11	37	5	15	8
Oust [1]	Sulfometuron-Methyl	0.0625 (1 oz.)	120	200	0	0	0
2,4-D	2,4-D	2.0	50	3	0	0	0
Plateau	Imazapic	0.75	0	5	0	0	0
Banvel	Dicamba	1.0	0	27	2	0	0
Escort	Metsulfuron-Methyl	0.0625 (1 oz.)	100	52	0	0	0
Total acres treated:			505	1,163	167	45	50
Subbasin acreage:			455,040	793,600	372,500	1,497,000	752,000
Percentage of subbasin treated:			0.11%	0.15%	0.04%	0.003%	0.007%

[1] Use of Oust herbicide on all public lands in Idaho is suspended under BLM, Idaho State Office, Instruction Memorandum No. ID-2002-003). Under the moratorium, the earliest date oust could be used by the CFO is fall, 2003.

[2] Acreage exclusive of the North Fork and Middle Fork Clearwater Rivers.

2. Best Management Practices for Herbicide Treatments

Best Management Practices (BMPs) to minimize or avoid harming listed fish are described fully in Appendix D of the BA, and summarized in this section.

a. General Safeguards

(1) The BLM will follow established guidelines and BMPs as stated in: (1) BLM Manual 9011, Chemical Pest Control; (2) BLM Manual Handbook H-9011-1; (3) Final Environmental Impact Statement, Vegetation Treatment on BLM Land in Thirteen Western States, May 1991; and (4) BLM Coeur d'Alene Programmatic Noxious Weed Control EA, 1994.

(2) The BLM will have a certified/licensed pesticide applicator overseeing all spray projects on-site.

(3) A spill cleanup kit will be available whenever pesticides (herbicides) are transported or stored.

(4) A spill contingency plan will be developed prior to all herbicide applications. Individuals involved in herbicide handling or application will be instructed on the spill contingency plan and spill control, containment, and cleanup procedures.

(5) Herbicide applications will only treat the minimum area necessary for the control of noxious weeds.

(6) During application, weather conditions would be monitored hourly by trained personnel at spray sites (i.e., wind speed, temperature, relative humidity). Additional weather and application monitoring would occur whenever a weather change may impact safe placement of the herbicide on the target area.

(7) All pesticide label instructions will be followed, except where more restrictive measures are required as described in the BA, or in this Opinion.

(8) Maximum wind speed restrictions will be followed, as described for each herbicide application method in Table 3.

(9) Spraying will not be done if precipitation is occurring or is imminent; if air turbulence is sufficient to affect the normal spray pattern; or if snow or ice covers the target foliage.

(10) No carrier other than water will be used.

(11) Within any 6^{th} code HUC, no more than 1,000 acres of Federal (BLM and Forest Service [FS]) herbicide application will occur annually.

(12) 2,4-D ester formulations will not be used.

(13) Non-target plant exposure and introduction of chemicals in the water will be avoided or minimized through the no-spray buffers and wind speed restrictions described in Table 3.

b. Weather Considerations

(1) Treatment will be delayed if precipitation is forecasted to occur within 24 hours of scheduled application.

(2) During application, weather conditions will be monitored hourly by trained personnel at spray sites. Additional weather monitoring will occur whenever a weather change may impact safe placement of the herbicide on the target area.

c. Helicopter (Aerial) Spraying

(1) Helicopter service landings or fuel storage will not occur within 200 feet of fish-bearing streams and lakes, 150 feet of perennial streams, or 100 feet of intermittent streams, springs, seeps, wetlands, and ponds.

(2) Helicopter spray projects will have a fuel transportation, storage, and spill plan developed to reduce risks associated with helicopter fuels.

(3) A pre-project evaluation of riparian buffers and live waters will be made by a fisheries biologist and district weed coordinator to determine where special monitoring (i.e., test cards, dye) for helicopter spraying may be needed to ensure that buffers are adequate for protection of riparian areas and live waters. Buffer distance may be increased if special conditions such as topography, steep slopes, fish habitat, and risk analysis warrant an increase in buffer width.

(4) Helicopter spraying of steep-sloped sites will not be authorized if wind direction and/or steep slopes may potentially result in drift of herbicides that could reach non-target riparian areas. Monitoring of spray drift (i.e. test cards, dye) may be used to insure that buffers are adequate to protect riparian/aquatic habitats from accidental drift. The buffer distance will be increased, and other spray parameters (droplet size, aircraft elevation, wind speed) will be adjusted as needed, if monitoring indicates that chemicals are reaching non-target riparian areas.

(5) All aerial applications would be on the contour. No turns would be allowed over live waters even though booms are turned off at the end of each run.

Table 3. Buffers, maximum wind speed, application methods, and herbicide restriction associated with aquatic habitats, riparian areas, and wetland resources.

No-Spray Buffer Width	Max. Wind Speed	Herbicide Application Method	Restrictions
>200 feet from outer edge of riparian area for fish bearing waters	5 mph	aerial	none
>150 feet from outer edge of riparian areas for perennial non-fish bearing waters	5 mph	aerial	none
>100 feet from outer edge of riparian areas for intermittent non-fish bearing waters	5 mph	aerial	none
0 - 100 feet from live waters or shallow water tables	n/a	no applications of picloram will be authorized	none
>100 feet and areas outside riparian areas	8 mph	all ground/broadcast spraying	none
>100 feet and areas outside riparian areas	n/a	wicking, dipping, painting, and injecting	none
15-100 feet from live water or shallow water tables; or within riparian areas	8 mph	ground/spot spraying (no broadcast boom spraying), wicking, wiping, dipping, painting, injecting selective spraying of target species only (e.g., spot treatment of individual plants)	none
<15 feet from live water or shallow water tables	5 mph	backpack sprayer, hand-pump sprayer, wicking, wiping, dipping, painting, and injecting selective spraying/treatment of target species only (e.g., spot treatment of individual plants)	aquatic approved herbicides only no surfactants authorized

(6) Aerial application equipment will be designed to deliver a median droplet diameter of 200 to 800 microns. This droplet size is considered large enough to avoid excessive drift while providing adequate coverage of target vegetation.

d. Equipment Handling

(1) Equipment used for transportation, storage, or application of chemicals shall be maintained in leakproof condition.

(2) No herbicide mixing will be authorized within 100 feet of any live waters. Mixing and loading operations must take place in an area where an accidental spill would not contaminate a stream or body of water before it could be contained.

(3) Spray tanks will not be washed or rinsed in or near water. All chemical containers will be disposed of at sites where the containers will not cause contamination of salmon or steelhead habitat.

(4) Only the quantity of herbicides needed for the days' operation will be transported from the storage area.

e. Additional Safeguards for Aquatic Species

(1) No more than one application of picloram will be made on a given site in any given year to reduce the potential for picloram accumulation in the soil.

(2) Spraying of picloram will be authorized within 100 feet of any live waters or shallow water tables will not be authorized.

(3) Within 15 feet of live waters or areas with shallow water tables, the only herbicides authorized for use are aquatic approved herbicides and methods of control would include backpack sprayer, handpump sprayer, wicking, wiping, dripping, painting, or injecting.

(4) No surfactants will be authorized for use within 15 feet of live waters or areas with shallow water tables. The surfactant R-900 will not be authorized for use, regardless of distance from water.

(5) Manual control (e.g., hand pulling, grubbing, cutting, etc.) is authorized in all areas, and may be used in sensitive areas to avoid adverse effects to non-target species or water quality. All noxious weed disposal will be in accord with proper disposal methods. Noxious weeds which have developed seeds will be bagged and burned.

3. Spray Monitoring and Reporting

a. Non-target plant mortality in riparian areas will be monitored to determine if mortality of non-target plants is affecting riparian functions.

b. Spray cards, dye or other type of indicator to monitor chemical drift will be used at the outer boundary of riparian areas and water edges on a small sample (no less than five sites) of riparian treatment areas. These indicators will provide evaluation of implementation of buffers or visual verification that application methods are minimizing risk to listed fish species. Findings from these indicators will be included with the annual monitoring results.

c. Report to NOAA Fisheries and USFWS after the field season and prior to 2004 weed control activities, the actual number of acres treated, the chemicals used, application methods, and location of treatment sites (e.g., 6th code HUCs). This report will also include summaries of monitoring results (e.g., numbers 6 and 7 in *General Guidelines*).

C. Description of the Action Area

An action area is defined by NOAA Fisheries regulations (50 CFR Part 402) as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The action area affected by the proposed action includes BLM lands in the following subbasins (4th code HUCs): Lower Snake River (17060703), Lower Salmon River (17060209), Little Salmon River (17060210), Clearwater River (17060306), and South Fork Clearwater River (17060305); and rivers and streams downstream from BLM lands that potentially receive herbicide inputs through direct contamination, runoff, or percolation. The BLM administered lands in the action area are located in widely scattered small to moderate sized parcels intermingled with private, state, and other Federal lands. A more precise description of the spraying locations is found in Appendix A of the BA. The area affected by the proposed action includes the weed treatment locations specified in Appendix A of the BA, and extending downstream to mouths of the subbasins listed above. This area includes habitats that serve as migratory corridors for juveniles and adults, spawning areas, and juvenile rearing areas for salmon EFH, Snake River steelhead and Snake River spring/summer and fall chinook salmon. Snake River Sockeye salmon pass through the action area in the mainstem of the Lower Salmon River during juvenile and adult migrations.

II. ENDANGERED SPECIES ACT BIOLOGICAL OPINION

The objective of this Opinion is to determine whether the proposed 2003 noxious weed program is likely to jeopardize the continued existence of Snake River steelhead or Snake River spring/summer chinook salmon. NOAA Fisheries concurs with the CFO's determination that the proposed action is not likely to adversely affect Snake River fall chinook salmon, or critical habitat for spring/summer and fall chinook salmon; consequently, this Opinion does not evaluate effects of the action on fall chinook salmon or critical habitat for any of the listed species.

A. Evaluating the Effects of the Proposed Action

The standards for determining jeopardy and destruction or adverse modification of critical habitat are set forth in section 7(a)(2) of the ESA as defined by 50 CFR 402.02 (the consultation regulations). In conducting analyses of actions affecting fish habitat under section 7 of the ESA, NOAA Fisheries uses the following steps of the consultation regulations, and when appropriate[1] combine them with "The Habitat Approach" (NMFS 1999): (1) Describe the status and biological requirements of the listed species; (2) evaluate the relevance of the environmental baseline in the action area to the species' current status; (3) determine the effects of the proposed or continuing action on the species, and whether the action is consistent with the available recovery strategy (if one exists); and (4) determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the effects of the environmental baseline, and any cumulative effects, and considering measures for survival and recovery specific to other life stages. In making a determination, NOAA Fisheries decides whether the action under consultation, together with all cumulative, direct, indirect, and interdependent and interrelated effects, when added to the environmental baseline, is likely to jeopardize the ESA listed species or result in the destruction or adverse modification of critical habitat. If jeopardy or adverse modification of critical habitat are found, NOAA Fisheries may identify reasonable and prudent alternatives for the action that avoid jeopardy and/or destruction or adverse modification of critical habitat.

The jeopardy/adverse modification of critical habitat determination, above, requires consideration of the effects of the action on essential habitat features in the action area, effects on the survival of individual fish, and effects on the demographics of the Evolutionarily Significant Unit (ESU). The replacement rate of the population (lambda) is used to indicate the predominant demographic trend. When lambda equals one, the number of juveniles surviving to reproductive maturity is equal to the number of adults in the previous generation, and the population is neither increasing or decreasing. Lambda values below or above one indicate decreasing or increasing population sizes, respectively. In this Opinion, the threshold for finding jeopardy or adverse modification would be any action that would cause lambda (averaged over several generations) to drop below 1. If the average baseline replacement rate is already greater than one, or if the baseline replacement rate is less than 1, the finding would be jeopardy/adverse modification if the action appreciably diminishes lambda, or appreciably suppresses or delays an increase in

[1]The Habitat Approach is intended to provide guidance to NOAA staff for conducting analyses, and to explain the analytical process to interested readers. As appropriate, The Habitat Approach may be integrated into the body of Opinions. NOAA staff are encouraged to share The Habitat Approach document with colleagues from other agencies and private entities who are interested in the premises and analysis methods.

lambda. This analysis also guides development of any Reasonable and Prudent Alternatives or Reasonable and Prudent Measures, which are based on consideration of how the proposed action meets recovery goals.

1. Biological Requirements in the Action Area

In this Opinion, the biological requirements of Snake River steelhead and Snake River spring/summer chinook salmon are considered for each freshwater life stage in the action area and for each ESU as a whole. The action area supports spawning, incubation, juvenile rearing (fry to smolt stages), and juvenile and adult migration of chinook salmon and steelhead. Adult steelhead also reside in mainstem rivers in fall and winter, prior to dispersal into tributary streams for spawning in the spring, and adult spring/summer chinook salmon stage in pools near spawning areas from several weeks to a month prior to spawning. The biological requirements considered in this Opinion are those necessary for a species to complete those portions of its life cycle that would normally occur in the action area, and ultimately, for the listed ESUs to reach naturally-reproducing population sizes large enough to safeguard the genetic diversity of the listed ESUs, and allow them to become self-sustaining in the natural environment. The survival and recovery of these species will depend on their ability to persist through periodic environmental disturbances and climatic variation that cause episodes of low natural survival.

The 2003 noxious weed program would occur within designated critical habitat for Snake River sockeye salmon, spring/summer chinook salmon, and fall chinook salmon ESUs. Freshwater critical habitat includes all waterways, substrates, and adjacent riparian areas below longstanding, natural impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) and dams that block access to former habitat. Riparian areas adjacent to a stream provide the following functions: shade, sediment delivery and filtering, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter. Critical habitat is not designated for Snake River steelhead at this time, although steelhead occur throughout the action area.

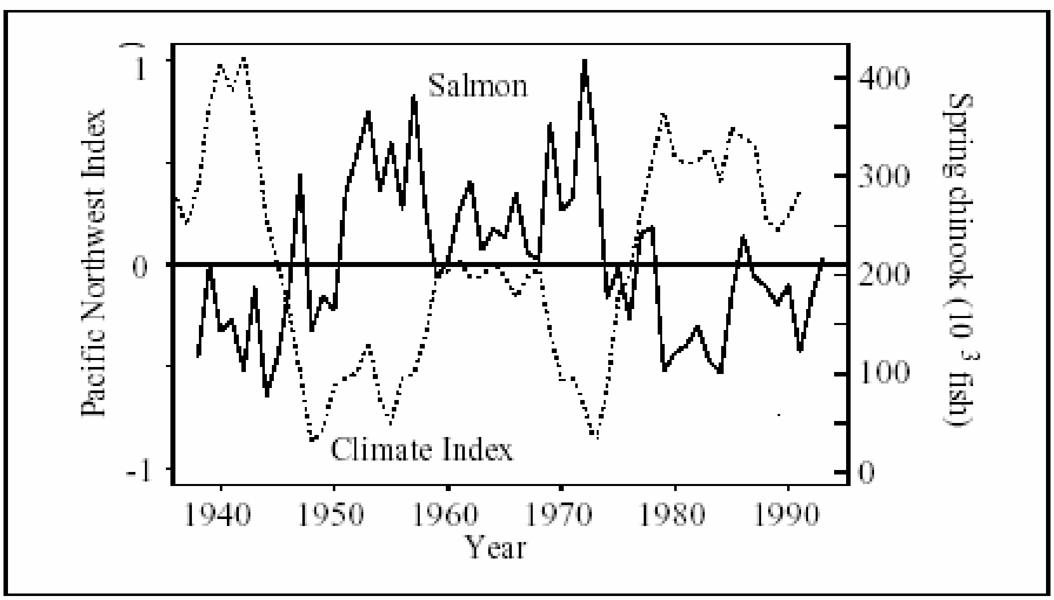
For this consultation, the essential habitat features that function to support the life stages found in the action area are: (1) suitable array of stream bed materials (boulders, cobbles, gravel, etc.), (2) water quality, (3) flow regimes (quantity and timing of discharge), (4) water temperature, (5) hydraulic characteristics (water velocity, depth, channel gradient), (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions. All of these essential habitat features of critical habitat are included in a NMFS (1996) analysis framework called *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (hereafter referred to as the "Matrix"). The BLM used the Matrix to evaluate the environmental baseline condition and effects of the action on essential habitat features for salmon and steelhead.

2. Status of Species

This section describes the listing status, general life history, and population trends of listed species likely to be adversely affected by the proposed action. The BLM determined that the proposed action is likely to adversely affect Snake River spring/summer chinook salmon and Snake River steelhead, and not likely to adversely affect Snake River sockeye salmon, fall chinook salmon, or critical habitat for sockeye and chinook salmon. Based on the life histories of the Snake River spring/summer chinook salmon and steelhead ESUs, it is likely that spawning, incubation, and juvenile rearing (fry to smolt stages) would be adversely affected by the proposed action. The action is unlikely to adversely affect juvenile and adult migration or adult holding.

Pacific salmon and steelhead in the Pacific Northwest exhibit cyclic variation in population size that closely corresponds to oscillations in climate conditions affecting ocean temperatures and circulation and temperature and precipitation patterns in the freshwater environment (Anderson 1996; Finney et al. 2002; Hare and Francis 1994; Mantua et al. 1997) The Pacific Northwest Index (PNI) developed by Ebbesmeyer and Strickland (1995) is a composite index that characterizes Pacific Northwest climate patterns in both coastal waters and freshwater habitats. The PNI uses air temperature in the San Juan Islands, precipitation in the Cascade Mountains, and snowpack depth on Mount Rainier to calculate the index. The PNI is correlated with variations in the Columbia River spring chinook catch. The cool wet climate pattern, which is characterized by negative PNI values, corresponds with above average Columbia River spring chinook catch and periods of warm dry weather correspond with lower than average catch
(Figure 1).

Figure 1. Relationship of the PNI and commercial catch of Columbia River chinook salmon, from Anderson (1996).



The 5-year running average PNI indicates a shift to a warm/dry period beginning in 1977, and continuing today. Moderately warm/dry conditions were observed in 1996 and 2000, and wet/cold conditions were observed in 1997 and 1999, which are likely related to the exceptionally large adult anadromous fish returns observed from 2000-2002. Because climatic and ocean conditions vary from year-to-year, the recent increases in anadromous fish populations are likely to be short-lived. The long-term trends for Snake River spring/summer chinook salmon and steelhead populations still appear to be declining (Figures 2 and 3), although a change in the direction of a time series trend (inflection point) would be difficult to detect before several years have passed beyond the point of inflection. In light of the effects of climatic variation, the survival and recovery of Pacific salmon and steelhead depends on their ability to persist through episodic periods of warm, dry conditions where there is naturally low survival. To avoid extinction, it is necessary to maintain, improve, or restore essential habitat features that sustain anadromous fish through periods of unfavorable climatic conditions.

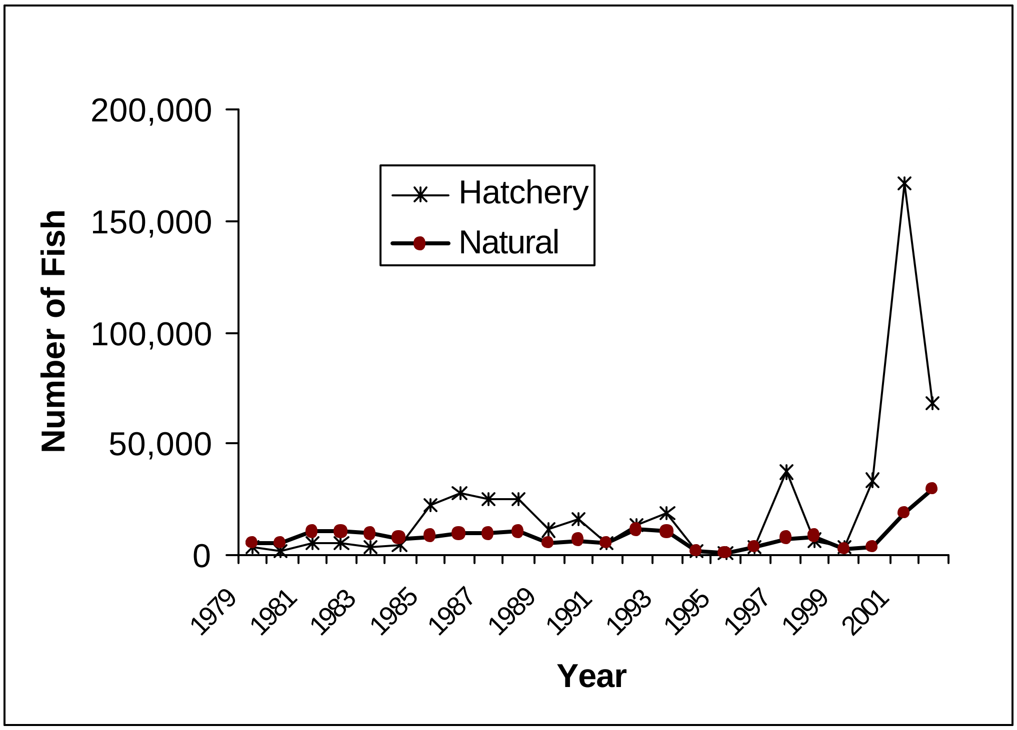
a. Status of Snake River Spring/Summer Chinook Salmon

The Snake River spring/summer chinook salmon ESU, listed as threatened on April 22, 1992, (67 FR 14653), includes all natural-origin populations in the Tucannon, Grande Ronde, Imnaha, and Salmon Rivers. Hatchery fish returning to fish traps in the Tucannon, Imnaha, and Grande Ronde, Salmon, Pahsimeroi, and South Fork Salmon Rivers are included in the listed ESU. Critical habitat was designated on December 28, 1993, (58 FR 68543) and revised on October 25, 1999, (64 FR 57399). Protective regulations were established on July 10, 2000, (65 FR 42422).

Spring/summer chinook salmon in the Clearwater River drainage are not included in the listed ESU because the stock is largely non-indigenous (Matthews and Waples 1991). Indigenous spring/summer chinook salmon in the Clearwater River drainage were virtually eliminated by dams constructed in the mainstem Clearwater River at Lewiston in 1927, and in the South Fork Clearwater River at Harpster in 1910 (Cramer et al. 1998; Schoen et al. 1999). The Harpster dam was a complete fish migration barrier to salmonid migration from 1910 to 1935, and from 1949 until 1963, when the dam was removed (Cramer et al. 1998). A second dam existed on the mainstem Clearwater River near Lewiston from 1927 to 1974, but marginal with partially effective fish passage from 1927 to 1939. Since removal of the dams, non-indigenous spring/summer chinook salmon have developed naturally reproducing runs in Lolo Creek, and mainstem and tributaries of the Lochsa, Selway, and South Fork Clearwater Rivers (Larson and Mobrand 1992) from reintroduction since 1973.

Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer chinook salmon in some years during the late 1800s (Matthews and Waples 1991). By the 1950s the abundance of spring/summer chinook had declined to an annual average of 125,000 adults, and continued to decline through the 1970's. Returns were variable through the 1980s, but declined further in the 1990s. Adult returns counted at Lower Granite Dam reached all-time lows in 1994 and 1995 (1,797 adult returns in 1995), after which, a modest increase occurred through 2000. Adult returns at Lower Granite Dam dramatically increased after 2000, with 185,693 adults returning in 2001, and 97,184 in 2002. The large increase in 2001 was due primarily to hatchery returns, with only 10% of the returns from fish of natural origin. However, returns of natural-origin adult spring/summer chinook salmon at Lower Granite Dam in 2001 were 3.5 times the 1979 - 2002 average, and more than twice this average in 2002. These large returns in recent years are thought to be a result of cyclic ocean and climatic conditions favorable to anadromous fish (discussed above); consequently, the large returns are not expected to continue. The long-term trend for this species is a gradual population decline, with periodic oscillations, such as the increase in adult returns in the last few years (Figure 2).

Figure 2. Counts of wild and hatchery-origin Snake River spring/summer chinook salmon passing through Lower Granite Dam, 1979 - 2002 (From NPPC 2003).



Habitat problems are common in the range of this ESU. Spawning and rearing habitats are impaired in places from factors such as tilling, water withdrawals, unpaved roads, timber harvest, grazing, mining, and alteration of floodplains and riparian vegetation. Mainstem Columbia River and Snake River hydroelectric developments have altered flow regimes and estuarine habitat, and disrupted migration corridors. Competition between natural indigenous stocks of spring/summer chinook salmon and spring/summer chinook of hatchery origin has likely increased due to an increasing proportion of naturally-reproducing fish of hatchery origin.

For the Snake River spring/summer chinook ESU as a whole, NOAA Fisheries estimates the median population growth rate (lambda), from 1980-1994, ranges from 1.012 to 0.796 (Table 4), depending on the assumed success of hatchery fish spawning in the wild. Lambda decreases with increasing success of instream hatchery fish reproduction, compared to fish of wild origin (Tables B-2a and B-2b in NMFS 2000). NOAA Fisheries estimated the risk of absolute extinction for the aggregate Snake River spring/summer chinook population to be zero in 24 years regardless of hatchery fish reproduction, and from 0.00 to 1.00 in 100 years, depending the success of instream hatchery fish reproduction (Table 4). This analysis period does not include the higher returns observed since 1996. In recent years with large adult returns, the increase in hatchery fish compared to wild fish has been substantially greater; consequently, even though the number of recruits per spawner has appeared to increase for natural fish, the estimate of lambda for natural fish may actually decline from the values in Table 4, due to the disproportionate increase in hatchery fish. Detailed information on the current range-wide status of Snake River chinook salmon under the environmental baseline, is described in Attachment B.

Table 4. Annual rate of population change (λ) in Snake River spring/summer chinook salmon, absolute risk of extinction (1 fish/generation), and risk of 90% decline in 24 and 100 years for the period 1980-1994†. The range of reported values assumes that hatchery-origin fish either do not contribute to natural production or are as productive as natural-origin spawners.

Model Assumptions	l	**Risk of Extinction**		**Probability of 90% decrease in stock abundance**	
		24 years	100 years	24 years	100 years
No Correction for Hatchery Fish	1.012	0.00	0.00	0.014	0.072
No Instream Hatchery Reproduction	0.964	0.00	0.04	0.002	0.914
Instream Hatchery Reproduction = Natural Reproduction	0.796	0.00	1.00	0.996	1.000
† From Table B-2a and B-2b. Cumulative Risk Initiative. September 5, 2000, revised appendix B (McClure et al. 2000).					

b. Status of Snake River Steelhead

The Snake River steelhead ESU, listed as threatened on August 18, 1997 (62 FR 43937), includes all natural-origin populations of steelhead in the Snake River basin of southeast Washington, northeast Oregon, and Idaho. None of the hatchery stocks in the Snake River basin are listed, but several are included in the ESU.

Natural runs of Snake River steelhead have been declining in abundance over the past decades. For the Snake River steelhead ESU as a whole, the median population growth rate (lambda) from years 1980-1997, ranges from 0.699 to 0.978, depending on the assumed number of hatchery fish reproducing in the river (Table 5). Some of the significant factors in the declining populations are mortality associated with the many dams along the Columbia and Snake Rivers, losses from harvest, loss of access to more than 50% of their historic range, and degradation of habitat used for spawning and rearing. The Harpster Dam blocked steelhead passage from 1910 - 1935, while the Lewiston Dam limited steelhead passage, but it was not a complete barrier. Habitat losses are similar to those described above for chinook salmon. Possible genetic introgression from hatchery stocks is another threat to Snake River steelhead since wild fish comprise such a small proportion of the population.

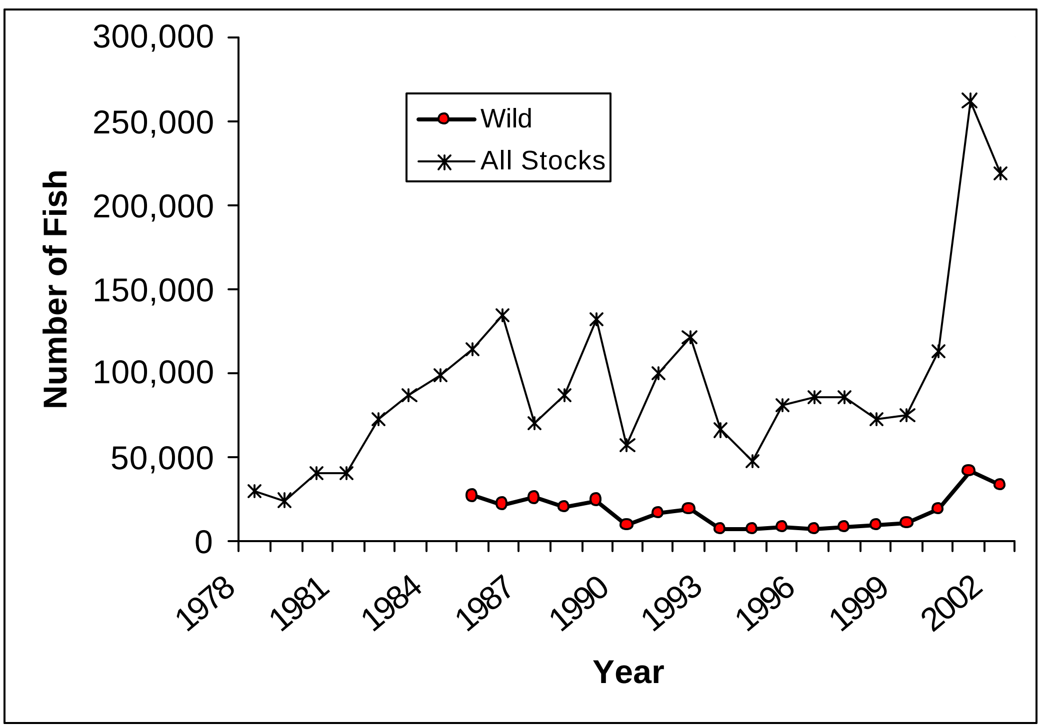
Table 5. Annual rate of population change (λ) in Snake River steelhead, absolute risk of extinction (1 fish/generation), and risk of 90% decline in 24 and 100 years for the period 1980-1994†. The range of reported values assumes that hatchery-origin fish either do not contribute to natural production or are as productive as natural-origin spawners.

Model Assumptions	l	**Risk of Extinction**		**Probability of 90% decrease in stock abundance**	
		24 years	100 years	24 years	100 years
No Correction for Hatchery Fish	0.978	A-Run 0.000 B-Run 0.000	A-Run 0.000 B-Run 0.000	A-Run 0.000 B-Run 0.060 Aggregate 0.000	A-Run 0.000 B-Run 0.520 Aggregate 0.434
No Instream Hatchery Reproduction	0.910	A-Run 0.000 B-Run 0.000	A-Run 0.010 B-Run 0.093	A-Run 0.200 B-Run 0.730 Aggregate 0.476	A-Run 1.000 B-Run 1.000 Aggregate 1.000
Instream Hatchery Reproduction = Natural Reproduction	0.699	A-Run 0.000 B-Run 0.000	A-Run 1.000 B-Run 1.000	A-Run 1.000 B-Run 1.000 Aggregate 1.000	A-Run 1.000 B-Run 1.000 Aggregate 1.000

† From Table B-2a and B-2b. Cumulative Risk Initiative. September 5, 2000, revised appendix B (McClure et al. 2000).

No estimates of historical (pre-1960s) Snake River steelhead abundance are available. In general, aggregate (combined counts of wild and hatchery-origin fish) steelhead abundance declined sharply in the early 1970s, rebuilt modestly from the mid-1970s through the 1980s, and declined again during the 1990s. Adult returns at Lower Granite Dam dramatically increased since 2000: however, the recent increase is due primarily to hatchery returns, with wild fish comprising only 15-18% of the adult returns since 2000 (Figure 2). The large returns in recent years are thought to be a result of cyclic ocean and climatic conditions favorable to anadromous fish (discussed above); consequently, the large returns are not expected to continue. The long-term trend for wild Snake River steelhead is a gradual population decline, with periodic oscillations, such as the increase in adult returns in the last few years (Figure 1). The longest consistent indicator of steelhead abundance in the Snake River basin is derived from counts of natural-origin steelhead at the uppermost dam on the lower Snake River. According to these estimates, the abundance of natural-origin summer steelhead at the uppermost dam on the Snake River declined from a 4-year average of 58,300 in 1964 to a 4-year average of 8,300 ending in 1998. The most recent 4-year average of wild fish (1998-2002) is 26,358 adults. Parr densities in natural production areas have been substantially below estimated capacity (Hall-Griswold and Petrosky 1996).

Figure 5. Counts of wild and aggregate (wild and hatchery-origin) Snake River steelhead passing over Lower Granite Dam, 1978 -2002 (from NPPC 2003).



Additional information on the biology and habitat elements for Snake River steelhead are described in Busby et al. (1996) and detailed information on the current range-wide status of Snake River steelhead, under the environmental baseline, is described in Attachment A.

3. Environmental Baseline in the Action Area

The environmental baseline is defined as: "The past and present impacts of all Federal, state, or private actions and other human activities in the action area, including the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation and the impacts of state and private actions that are contemporaneous with the consultation in progress" (50 CFR 402.02). In this section, the environmental baseline in the action area is evaluated in light of the species' current status.

The primary features of the environmental baseline affected by the proposed action are water quality, through the introduction of herbicides into waters occupied by listed salmon and steelhead, and changes in the terrestrial vegetation as a result of weed treatments. Neither herbicide use or vegetation changes from weed infestation or weed removal are obvious factors affecting the survival or recovery of listed Snake River salmon or steelhead under the environmental baseline. However, little is known about the effects of weed infestations or about sublethal effects of herbicide formulations on fish productivity in the action area. No monitoring data are reported for water contamination by herbicides in the action area; however, fish tissue samples collected in the action area at Pittsburg Landing in the Snake River, and White Bird in the Salmon River, showed low levels of organochlorine compounds from exposure to insecticides (Clark and Maret 1998). Weed infestations are severe in portions of the action area, particularly in the grassland communities in the Salmon River and Snake River canyons. In some of these areas, entire watersheds are dominated by exotic vegetation (weeds). Weed infestations are well established and most extensive in dry portions of the action area (areas receiving less than 18 inches annual precipitation).

The environmental baseline for Snake River salmon and steelhead has been affected by factors outside the action area, such as development and operation of the Federal Columbia River Power System, ocean harvest, and predation on salmon and steelhead smolts by seals and terns. Forestry, farming, grazing, road construction, mining, and urbanization have reduced the quantity and quality of historic habitat in much of the Snake River basin, including the action area. Habitat requirements for survival of listed Snake River salmon and steelhead are generally being met in most of the action area, but are not being met in certain drainages. Baseline conditions in each of the action area subbasins are summarized below from descriptions in subbasin BA (USDI-BLM 2000A, 2000B, 2000C, 2000D).

a. Lower Snake River (HUC 17060103) Subbasin Baseline

The Lower Snake River subbasin includes the Snake River drainage from the confluence with the Clearwater River, upriver to the confluence with the Salmon River. The subbasin includes a total of 455,040 acres and BLM lands comprise approximately four percent of the area. Private lands comprise the majority of the subbasin, followed by United States Forest Service (USFS), Idaho Department of Fish and Game (IDFG), BLM, Idaho Department of Lands (IDL), Nez Perce Tribe, and Nature Conservancy lands.

The mainstem of the Lower Snake River is used as an upstream and downstream passage corridor by sockeye salmon, fall chinook salmon, spring/summer chinook salmon, steelhead, bull trout, and westslope cutthroat trout. Fall chinook salmon use the mainstem Snake River for spawning and rearing, although a portion of the spawning areas historically used by fall chinook salmon are inundated by the pool above Lower Granite Dam. Spring/summer chinook salmon and steelhead use the mainstem river to a limited extent for rearing. Steelhead use most accessible tributaries for spawning and rearing. Within the subbasin, spring/summer chinook salmon are currently only using Asotin Creek (outside the action area) for spawning and rearing. Spring/summer chinook salmon will also use the mouth area or lower reaches of accessible tributaries for juvenile rearing.

Fish habitat in the mainstem Lower Snake River has been altered by the presence of hydropower dams. Lower Granite Dam creates a pool that harbors northern pike minnow and exotic warm-water species such as smallmouth bass that prey on juvenile anadromous fish. Hells Canyon Dam is impassable to upstream or downstream fish migration. Hells Canyon Dam eliminates access to thousands of miles of streams that were historically accessible to anadromous fish.

Private land uses include roads, livestock grazing, timber harvest, recreation, agriculture, urban development, and residences. The cities of Lewiston and Clarkston occur near the confluence of the Snake River and Clearwater River. The Hells Canyon National Recreation Area occurs upstream of Cache Creek. Land uses on BLM lands in the basin include timber harvest, roads, and recreation. The BLM currently has no authorized grazing use in the subbasin. Noxious weed control, recreation, prescribed burning, and wildlife/fisheries management activities are common activities occurring on BLM lands in the subbasin.

b. Lower Salmon River Subbasin

The Lower Salmon River Subbasin includes the Salmon River from its mouth to French Creek. This reach of the Salmon River is characterized by a steep rocky canyon where the channel alternates between large pools and boulder dominated rapids with a gradient of approximately 0.23%. The subbasin includes a total of 793,600 acres, and BLM lands comprise approximately seven percent of the area. Private lands comprise the majority of the subbasin, followed by USFS, BLM, IDFG, and IDL lands. Elevations within the subbasin range from 916 feet at the mouth to over 8,000 feet. Private land uses include livestock grazing, timber harvest, recreation, agriculture, communities, and residences. Historically, mining was a major land use along the Salmon River and in the Florence area. Public lands are limited to blocks of USFS lands in the mid and upper portions of the watersheds from White Bird up the Salmon River. The BLM lands within the subbasin are scattered and generally comprise a small percentage of any of the watersheds. Down river from White Bird Creek, approximately 80% of the river corridor is in BLM ownership, while upriver from White Bird Creek to French Creek, approximately 30% of the river corridor is in BLM ownership. Land uses on public lands include timber harvest, livestock grazing, roads, mining, and recreation.

The mainstem Salmon River is used primarily by listed salmonids as an upstream and downstream passage corridor. Spring/summer chinook salmon and steelhead use the mainstem Salmon River to a limited extent for rearing. Steelhead will use accessible tributaries for spawning and rearing. Spring/summer chinook salmon use White Bird Creek and Slate Creek for spawning and rearing, and also use the mouth area or lower reaches of accessible tributaries for juvenile rearing.

Water quality in the mainstem Salmon River is generally good, with low concentrations of pollutants. However, summer water temperatures in portions of the subbasin are elevated above those that might naturally occur, and sometimes well above the lethal limit for salmon and steelhead. Temperatures recorded at the USGS White Bird stream gage in the Salmon River ranged from 16.5° C to 28.0° C during July from 1976 to 1991. A combination of erodible soils, natural fires, periodic intense climatic events, and development of road systems have resulted in substantial natural and unnatural erosion and delivery of sediment to the Salmon River.

Many tributaries to the Salmon River have elevated deposition of fine sediment; however, casual observation of the river bed does not indicate that deposition of fine sediment is a serious problem in the mainstem. The river bed appears to be largely composed of cobble and boulder material which would seem to offer abundant cover for salmonids. Although interstitial deposition of fines is evident, certain habitats such as pool tailouts, appear to be relatively free of fine sediment deposition. During a 1993 survey at river mile (RM) 65.7, the BLM estimated cobble embeddedness in the Salmon River to be 26.3% and surface fines (particle size less than 6.3mm) to be 4.4%. This indicates low to moderate impacts to rearing habitat. During a 1994 survey at RM 90.8, the BLM estimated cobble embeddedness to be 39.5% and found spawning gravels to contain 19.5% fines.

Stream channel conditions are highly variable throughout the subbasin. Headwater streams, breakland streams, and smaller tributary streams are predominately steep-gradient, confined channels, with high sediment transport capacity. These steep gradient streams may be subject to frequent scouring events. The larger tributaries are typically moderate gradient and are moderately confined. These channels are also efficient at sediment transport. The upper reaches of some streams flowing through low gradient prairie areas, meadows, or forest stringer meadows generally have Rosgen C and B channel types (Rosgen 1996). Many tributaries have elevated summer water temperatures which often reach 20°C. Elevated deposited sediment levels exist in many tributaries. The amount of deposited sediment is dependent on channel types, flow regimes, land types, and land uses within the watershed.

c. Little Salmon River Subbasin

The Little Salmon River subbasin includes a total of 372,500 acres. The BLM lands within the subbasin total 16,344 acres (4%). Fifty-six percent of the subbasin are USFS lands (Payette and Nez Perce National Forests); 30.5% are privately owned lands; six percent are Wilderness, National Recreation Area, and Wild and Scenic River Corridor (all in the Rapid River subwatershed); and 3.5% are administered by the State. The upper half of the watershed occurs in a wide valley surrounded by forested mountain slopes. The mean subbasin elevation is 5,430 feet, with elevations ranging from 1,760 to 9,393 feet. Annual precipitation ranges from less than 20 inches at Riggins, Idaho, to over 50 inches near Brundage Mountain.

A large variety of past and present land uses have affected salmon and steelhead in this drainage. Human activities in the subbasin include logging, roads, trails, water withdrawal, agriculture, livestock grazing, residences, communities, and recreation. The higher elevation lands of the USFS have been used for timber harvest, livestock grazing, and recreation. The BLM lands within the subbasin have also been used primarily for timber harvest and livestock grazing. Major subwatersheds in the Little Salmon River include Rapid River, Elk Creek, Boulder Creek, Hazard Creek, Hard Creek, Round Valley Creek, and Goose Creek. U.S. Highway 95 parallels the Little Salmon River, and encroaches on riparian areas and floodplains in the lower canyon reach. Several small towns occur in the subbasin, ranging in size from a few hundred people to slightly more than one thousand. The predominant uses on BLM lands that have impaired aquatic habitat include roads, timber harvest, and livestock grazing. The Rapid River drainage is mostly roadless and fish habitat has not been altered significantly in the majority of the drainage; however, the lower 3 miles has been severely degraded by human activities. The remainder of fish habitat in the Little Salmon River drainage has been moderately to severely degraded from streamside roads, riparian logging, and cattle grazing.

The Little Salmon River drainage (below a fish barrier at RM 24.0) provides habitat for listed spring/summer chinook salmon, steelhead, and bull trout. Priority watersheds for spring/summer chinook salmon, and steelhead include Rapid River, Boulder Creek, Hazard Creek, and Hard Creek (NOAA Fisheries 1995 and 1998 Biological Opinions on PACFISH amended Land and Resource Management Plans). Rapid River is considered a stronghold for spring/summer chinook salmon, and steelhead. The most significant chinook and steelhead spawning and rearing areas are found in Rapid River and Boulder Creek drainages. To a lesser extent, chinook salmon and steelhead spawning and rearing also occurs in Hazard Creek, Hard Creek, and the mainstem Little Salmon River. All accessible tributary streams, downstream from RM 24.0, are used for steelhead spawning and rearing. Adult steelhead have been observed in Squaw Creek, Sheep Creek, Denny Creek, Hat Creek, Lockwood Creek, Rattlesnake Creek, Elk Creek, and Trail Creek. These small steep gradient tributaries provide limited production. The mouth areas of these streams or lower reach segments (downstream from barriers) may provide rearing habitat for juvenile chinook salmon, but the value of these small tributaries for rearing is limited.

d. Clearwater River Subbasin

The Clearwater River subbasin includes the mainstem Clearwater River and tributaries accessible to anadromous fish below the South Fork Clearwater River confluence. This subbasin includes a total of 1,497,000 acres. The BLM lands within the subbasin total 21,340 acres (one percent). The USFS lands total 136,000 acres (nine percent). The majority of the ownership in the subbasin is private. Other ownership in the drainage includes IDL, Nez Perce Tribe, Corps of Engineers, and IDFG. The Clearwater River flows into the Snake River at Lewiston, Idaho, and Clarkston, Washington. Elevations within the subbasin range from 700 feet at the mouth of the Clearwater River to 5,810 feet in the headwaters of Lolo Creek. The Clearwater River flows through a canyon that is 2,000 to 3,000 feet deep. The adjacent plateaus or uplands are rolling and moderately sloped, and are primarily agricultural areas. Higher elevation areas in the subbasin are forested.

Private land uses include agriculture, timber harvest, livestock grazing, recreation, roads, urban development, and residences. Potlatch Corporation, a private timber company, has significant land ownership in the upper Potlatch and Lolo Creek watersheds. Scattered Nez Perce Tribal lands also occur throughout the subbasin. The USFS lands are limited to blocks in the upper Potlatch, Lolo, and Orofino Creek watersheds. The BLM lands within the subbasin are scattered and generally comprise only a small percentage of any watershed. Land uses on BLM lands primarily include timber harvest, livestock grazing, roads, and recreation. Many streams in this subbasin no longer support anadromous fish, and have been severely altered by roads, farming, housing development, streamside grazing, and small water withdrawals.

The subbasin provides habitat for listed fall chinook salmon, and steelhead. Spring/summer chinook salmon occurring within the subbasin are not ESA listed. The Nez Perce Tribe has been active in recent introductions of fall chinook salmon and coho salmon within the subbasin. The mainstem Clearwater River is used as an upstream and downstream passage corridor by fall chinook salmon, steelhead, spring/summer chinook salmon, and coho salmon. Fall chinook salmon use the mainstem Clearwater River for spawning and rearing. Steelhead are dispersed throughout this hydrologic unit, and use most accessible tributaries for spawning and rearing. Elevated water temperature, sediment deposition and low streamflows in the summer and fall limit salmon and steelhead use of many streams in this subbasin. Spring/summer chinook salmon and steelhead use the mainstem river, to a very limited extent, for spawning and rearing.

The Lolo Creek drainage is currently the only tributary in the action area used by spring/summer chinook salmon for spawning and rearing. Spring/summer chinook salmon use the mouth area or lower reaches of tributaries for juvenile rearing.

e. Lower South Fork Clearwater River and Tributaries

The South Fork Clearwater River subbasin is approximately 746,000 acres in size. Elevations range from 1,240 feet at the mouth to 10,000 feet, and precipitation ranges from 10 to 30 inches per year, evenly distributed throughout fall, winter and spring. Winter precipitation is mostly snow, and summers are relatively dry. This area is characterized by loess plains, hills with large steptoes and some river breaklands. Loess plains have low to medium density branching drainage patterns. The bedrock geology is predominantly Columbia River basalt, and to a lesser extent quartz dioritic gneiss. Rapid changes in runoff volumes are possible on basalt due to gain or loss of water from gravel lenses. Land use includes dry farming and livestock grazing on about 90% of the area. Canyon grasslands are in poor ecological condition and are generally heavily infested with noxious weeds, particularly yellow starthistle. Common timber types include Douglas fir and ponderosa pine; grand fir occurs at higher elevations and areas with higher moisture regimes (i.e. riparian areas, higher elevations, north aspects).

The mainstem South Fork Clearwater River begins at the confluence of American and Red Rivers. From this point to about Tenmile Creek, the mainstem is a relatively low gradient riffle/pool stream dominated by gravel and cobble substrate (USDA 1998). It has been highly altered by dredge mining and the placement of State Highway 14. From Tenmile Creek to Mill Creek, the mainstem is steeper, more confined, and the substrate is dominated by boulders and cobbles. Sediment is readily transported through this high-energy reach. From Mill Creek to just above Threemile Creek, to its confluence with the Middle Fork Clearwater River at Kooskia, the South Fork is a relatively flat, unconfined riffle/pool channel with gravel and cobble substrate. This lowest reach of the river has also been partially confined by dikes, most notably in the vicinity of Stites and Kooskia, Idaho.

The lower South Fork Clearwater River below Farrens Creek (RM 24.5; USFS boundary) has been affected to various degrees by aggradation, channelization, diking, riparian vegetation removal, and encroachment by developments, such as roads and buildings (USDA 1998). State Highway 14 parallels the river and has encroached on riparian areas and channels. Aggradation of the river is associated with bedload from upstream sources, but most noticeably from the major Camas Prairie tributaries (e.g. Butcher, Threemile, and Cottonwood Creeks) and local bank erosion. In the unconfined reaches, the net result is a channel that is wider and shallower, and with less large pools than existed under natural conditions. Fish habitat has been degraded through a reduction in cover and water depth, and through an increase in sediment deposition and summer water temperatures. In some years, much of the lower South Fork becomes unsuitable for cold water fishes due to warm water temperatures (USDA 1998). The South Fork Clearwater

River, Butcher Creek, Cottonwood Creek (mainstem and South Fork), Red Rock Creek, Stockney Creek, and Threemile Creek are currently listed as 303(d) Water Quality Limited Segments under the Clean Water Act.

Physical characteristics of the subbasin have been altered by agriculture, residential and commercial developments, livestock grazing, timber harvest, roads, and recreation. Floodplain developments occur on private lands, and numerous communities are present in the Lower South Fork Clearwater River subbasin. Steelhead migration in the Clearwater River basin, upstream from Harpster, Idaho, was completely blocked by the Harpster dam from 1910 to 1935, and from 1949 until 1963, when the dam was removed (Cramer et al. 1998). The Lewiston dam that existed on the mainstem Clearwater River from 1927 to 1974, had marginal fish passage from 1927 to 1939 due to a poorly constructed fish ladder. An improved fish ladder was installed in 1939 and many steelhead were able to pass over the dam after this time (Cramer et al. 1998).

Steelhead, bull trout, cutthroat trout, spring/summer chinook salmon, rainbow/redband trout, and Pacific lamprey are present in the mainstem South Fork Clearwater River. Tributary streams in the drainage can be broadly characterized as fish bearing tributary streams, non-fish bearing face drainages, and the mainstem river. The small face drainages are primarily composed of high energy breakland tributaries of the South Fork Clearwater River. The fish bearing tributaries are typically third and fourth order streams, with first and second order intermittent and perennial drainages that are non-fish bearing. The BLM lands occur in five tributary drainages that provide fish habitat in the Lower South Fork of the Clearwater River. The five tributary streams include Threemile Creek, Sally Ann Creek, Butcher Creek, Mill Creek, and Cottonwood Creek. The face drainages do not provide fish habitat due to low base flows, barriers, and steep gradient.

Fall chinook salmon use the mainstem Clearwater River as a juvenile and adult migration corridor. Primary fall chinook use within the Clearwater River subbasin is down river from the North Fork of the Clearwater River (RM 40.5). Steelhead use the mainstem South Fork Clearwater River as a juvenile and adult migration corridor. The mainstem South Fork Clearwater River is also used for adult over-wintering, juvenile rearing, and to a limited extent for spawning. Primary spawning and rearing occurs in South Fork Clearwater River tributary streams. Spring/summer chinook salmon use the mainstem South Fork Clearwater River as a juvenile and adult migration corridor. The mainstem South Fork Clearwater River is also used to a limited extent for juvenile rearing. Spring chinook spawning and rearing occurs primarily in larger tributary streams upriver from the USFS boundary.

B. Analysis of Effects of Proposed Action

Effects of the action are defined as: "The direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with the action, that will be added to the environmental baseline" (50 CFR 402.02). Direct effects occur at the project site and may extend upstream or downstream based on the potential for impairing essential habitat features of critical habitat. Indirect effects are defined in 50 CFR 402.02 as "those that are caused by the proposed action and are later in time, but still are reasonably certain to occur." They include the effects on listed species or critical habitat of future activities that are induced by the proposed action and that occur after the action is completed. "Interrelated actions are those that are part of a larger action and depend on the larger action for their justification" (50 CFR 403.02). "Interdependent actions are those that have no independent utility apart from the action under consideration" (50 CFR 402.02).

1. Effects of Proposed Action

The effects of the proposed action on listed species are evaluated in this section to determine if Snake River steelhead and spring/summer chinook salmon can be expected to survive with an adequate potential for recovery, if the proposed action is implemented. If the proposed action is likely to impair properly functioning habitat (alter habitat to extent that it does not fully support long-term salmonid survival), appreciably reduce the functioning of already impaired habitat, or retard the long-term progress of impaired habitat toward properly functioning condition (PFC), it cannot be found consistent with conserving the species.

The 2003 BLM Noxious Weed Control Program BA provides a detailed analysis of the effects of the proposed action on Snake River steelhead and spring/summer chinook salmon and their critical habitat in the action area. The BA analysis uses a standard risk analysis approach to describe toxic effects of herbicides on listed fish and aquatic organisms. The BA explains effects of weed removal on riparian areas and other watershed characteristics affecting essential habitat features in the action area or critical habitat for listed salmon and steelhead. The effects analysis in this Opinion focuses on those elements of the proposed action that have the potential to affect fish, their prey, or riparian functions. The analysis is based primarily on toxic effects of herbicides on listed fish and their prey, and secondarily on the physical effects of weed removal. Toxic effects may potentially harm listed fish by killing them outright, through sublethal changes in behavior or physiology, or indirectly through a reduction in the availability of prey. Physical effects of weed removal could potentially affect riparian functions such as shade, cover, debris recruitment, and sediment filtering.

a. Activity-Specific Effects

(1) Physical Weed Control. Physical weed removal includes manual or mechanized techniques to remove weeds (hand pulling, grubbing, mowing, tilling, discing, or plowing). The primary effect on aquatic species is exposure of bare topsoil to increased erosion, and subsequent runoff into aquatic systems. In locations where weeds are removed from stream banks, removal of weeds would result in a temporary loss of cover, which would be replaced by new plant growth through natural regeneration, or from re-seeding disturbed sites with desirable vegetation to compete with noxious weeds targeted for control. The amount of area where weeds would be physically removed is a small percentage of the CFO's management area. Soil disturbance and resulting production of sediment from this activity will likely be insignificant.

(2) Regulatory Weed Control Mechanisms. Regulatory control measures would have virtually no effect on listed fish or critical habitat. Proposed regulations would primarily restrict activities that could spread noxious weeds. In situations where vehicle access is restricted to reduce the spread of weeds, there could be a possible reduction in sediment. In situations where livestock grazing is reduced in riparian areas, the condition of riparian vegetation could improve.

(3) Biological Weed Control. The release of parasitic insects specific to certain noxious weed species has negligible potential for adverse effects on listed fish or their habitat. Insects have previously been released in the action to control noxious weeds, and there has been no apparent effect on listed fish or aquatic habitat. Insect releases do not eradicate target plants. They reduce the density of target plant species, and allow native plants to compete.

(4) Chemical Weed Control. In the proposed action, the risks to salmon and steelhead from herbicides occurs primarily through their toxicological effects as a result of water contamination, rather than other physical changes in fish habitat. Herbicides also affect terrestrial vegetation and watershed characteristics by killing or injuring plants, but these terrestrial changes in the proposed action are not expected to appreciably affect the aquatic environment because of the small proportion of land proposed for treatment, restricted use of herbicides in riparian areas, and regrowth of native vegetation in treated areas. One possible exception is in settings where exotic plants have become a significant vegetative component that has altered watershed processes through a shift in hydrologic characteristics or change in fire frequency, such as some breaklands in the Salmon and Snake River canyons (e.g. Vitousek et al. 1996). In these settings, restoration of native vegetation may also restore certain watershed processes toward PFC (NMFS 1996), and the use of herbicides may be the only feasible control method available.

Proposed chemical weed control activities involve the use of seven herbicides that may be used in several combinations, or in formulations that include adjuvants, such as surfactants, emulsifiers, or unspecified "inert" ingredients. The ecological risks to aquatic species and toxicological effects are not fully known for the herbicides and formulations in the proposed action. The effects analysis focuses on the toxicity of the active ingredients in the herbicide formulations; however, the adjuvants themselves could have toxic effects that would not be apparent in this analysis. There is ample information available to assess the risk of direct mortality from the active ingredients in the herbicide formulations in the proposed action. There is incomplete information available on ecological effects of the herbicides and their formulations (including effects on the invertebrates on which fish feed), sublethal effects of the active ingredients on listed species, and lethal or sublethal effects of product formulations (mixtures of active ingredients, adjuvents and inert ingredients). Due to concerns about the uncertainty of effects of pesticides on listed salmon and steelhead, Environmental Protection Agency (EPA) has been directed by the 9th District Court (Washington Toxics Coalition v. EPA) to consult with NOAA Fisheries on the effects of 55 pesticides, including 2,4-D, which is proposed for use by the CFO.

The effects of the herbicides proposed for use in this action are dependent on their level of toxicity to listed fish and other aquatic organisms, and the level of exposure (or likelihood) encountered by listed fish and their prey. Following this conceptual model, the effects analysis in this Opinion consists of three parts: (1) An evaluation of the likelihood that listed fish and other aquatic organisms will be exposed to the chemicals; (2) an evaluation of the direct effects of herbicide exposure on listed fish; and (3) an evaluation of the indirect effects of the chemicals on the biotic community.

b. Likelihood of Exposure to Herbicides

Quantitative estimates of exposure to herbicides under the proposed action were not provided in the BA since the exact treatment locations and the amount of chemicals that will be applied are not known ahead of time. The BA used a robust exposure scenario of applying the active ingredient directly to a 1 acre-foot pond to provide a general characterization of risk. The BA also cited results of fate and transport modeling reported in scientific literature, when available. Herbicides can enter water through atmospheric deposition, spray drift, surface water runoff, percolation, groundwater contamination and intrusion, and direct application. The proposed action includes numerous BMPs intended to minimize or avoid water contamination from herbicides (See Section I.B.2 in this Opinion, and Appendix D in the BA). The BMPs include stream and riparian buffers where chemical use is restricted or prohibited, limits on the amount of chemicals carried at a given time or applied to a given area, and rules governing application methods and timing. The likelihood of herbicides entering the water depends on the type of treatment and mode of transport, which are described below.

(1) Water Contamination from Wind Drift. The proposed action includes 1,064 acres of aerial herbicide application. Herbicide spraying can introduce chemicals directly into water through wind drift. Drift may occur during any spraying activity, including aerial applications, boom spraying, and hand spraying (but does not occur when wiping or wicking). Wind drift is most likely to occur with aerial applications, and least likely to occur during ground-based spraying, unless sprays are directed into the air, or sprays are delivered in a fine mist. Water contamination from wind drift is primarily dependent upon the elevation of the spray nozzle, air movement, and droplet size. The smaller a droplet, the longer it stays aloft in the atmosphere, allowing it to travel farther. In still air, a droplet of pesticide the size of 100 microns (mist-size) takes 11 seconds to fall 10 feet. The same size droplet at a height of 10 feet travels 13.4 feet horizontally in a 1 mph wind, and 77 feet at 5 mph wind. Droplets released from spray equipment are not uniform in size; consequently, the indicated droplet size is the median diameter, with half the droplets smaller than the indicated diameter. During temperature inversions, little vertical air mixing occurs and drift can translocate contaminates several miles. Low relative humidity and/or high temperature conditions will increase evaporation and the potential for drift. In the proposed action, aerial application equipment will be designed to deliver a median droplet diameter of 200 to 800 microns, and provisions are included for humidity and wind speed. With the proposed BMPs, the aerial droplet size is believed by BLM to be large enough to avoid excessive drift into no-spray buffers, while providing adequate coverage of target vegetation.

A study by Rashin and Graber (1993), looking at the effectiveness of BMPs used in Washington for aerial pesticide application, found BMPs to be only partially effective, or ineffective for a variety of aerial applications and monitoring periods. They determined that numerous factors influenced the effectiveness of BMPs for aerial herbicide application, including streamflow regimes, type of equipment used for application, operating parameters, relationships between stream flow and operating factors (e.g., nozzle configuration), decisions about buffer size or necessity, weather, herbicide used, and topography and other site factors. The authors concluded that improvements to all BMPs evaluated in the study were necessary to ensure achievement of State water quality standards, forest practice rules and product label restrictions. They proposed minimum buffers of 15 to 25 meters for downwind applications; 75 to 90 meters for upwind application along flowing streams, including those with minor or intermittent flows. They also recommended certain measures for determining the presence of surface water in ephemeral streams, specifications on the type of nozzle configurations and orientations, and operational restrictions based on weather conditions.

The BMPs for aerial applications in the proposed action (Section B.2) appear to offer a similar level of protection as the BMPs recommended by Rashin and Graber (1993), with a few minor differences, such as buffer distances measured from the streambank in Rashin and Graber (1993), whereas they are measured from the outer edge of the riparian area in the proposed action. Even with the BMPs recommended by Rashin and Graber (1993), they expect that the BMPs will not entirely keep herbicides from reaching the water. The amounts of chemicals expected to reach the water from wind drift were not quantified in the BA, and they are not known. However, based on the expected BMP effectiveness documented by Rashin and Graber (1993), the amount of chemical drift reaching the water is expected to be well-below concentrations where lethal effects are known to occur in salmon or steelhead. Because little is known about the sublethal effects of the herbicides on salmon and steelhead, the effects of herbicides on aquatic ecosystems, and concentrations where these effects might occur, it is possible that spray drift may reach the water in concentrations that could harm salmon or steelhead though sublethal effects, or indirectly though effects on other aquatic organisms.

(2) Water Contamination from Runoff, Leaching, and Percolation. All herbicides can potentially enter streams through water transported by runoff, leaching, or percolation. Water contamination from rain events could transport chemicals to waterways, and convey them to chinook salmon or steelhead habitat. The sorption of herbicides onto soils, stability, solubility, and toxicity of a chemical determine the extent to which it will migrate and adversely affect surface waters and groundwater (Spence et al. 1996). For example, Picloram is highly soluble and readily leaches through the soil. It is also resistant to biotic and abiotic degradation processes. It can also move from target plants, through roots, down into the soil, and into nearby non-target plants. Given this capability, a sufficient buffer zone is recommended to protect riparian vegetation when using picloram. Glyphosate and 2,4-D, though very soluble, bind well with organic material in soils and therefore are not easily leached. All of the herbicides proposed for use are susceptible to transport in surface runoff, especially if applications are followed immediately by high rainfall events. However, data limitations make it difficult to precisely estimate the degree of ecological risk.

The potential concentrations of chemicals in the water, as a result of contamination from the proposed action, are not known. The BA provides rough estimates of the amount of chemicals expected to reach the water, based on modeling or monitoring reported in published literature. Indicators of potential exposure are characterized by available information on factors that determine the likelihood of the chemicals reaching water. Indicators include physical properties of the chemicals; soil properties such as the amount of organic material, soil depth, soil type, pH, water content, and oxygen content; and environmental conditions such as temperature, and rainfall amounts. An environment containing dry soil with low microbial presence, which receives periodic high-intensity rainfall events, will be very susceptible to both leaching and surface runoff of picloram. This will also be true to a lesser extent with 2,4-D and glyphosate.

(3) Herbicide Movement Rating and Evaluation. The Oregon State University Extension Pesticides Properties Data Base (Vogue et al. 1994) provides a pesticide movement rating, derived from soil half-life, sorption in soil, and water solubility (Table 6). The pesticide movement rating indicates the propensity for a pesticide to move toward groundwater. There are five nominal ratings, ranging from very low to very high. As indicated by the movement ratings, glyphosate is least likely to reach groundwater or move from the site, while chemicals such as picloram and dicamba are highly mobile and are likely to be transported by runoff or percolation. Rain fall rates, soil properties, topography, vegetation, and other parameters are factors that influence actual pesticide movement at any given location.

c. Likelihood of Direct Effects

Most direct effects of the proposed action on listed salmon and steelhead are likely to be from sublethal herbicide effects, rather than outright mortality from herbicide exposure, or from weed control activities that do not involve herbicides. Sublethal effects are considered under the ESA to constitute “take,” if the sublethal effects “harm” listed fish. NOAA Fisheries defines harm as “an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns including breeding, spawning, rearing, migrating, feeding or sheltering" (50 CFR 222.102). These behavioral patterns, and their underlying physiological processes are typically reported for individual test animals. However, the ecological significance of sub-lethal toxicological effects depends on the degree to which they influence behavior that is essential to the survival and reproductive potential of individual fish, and the viability and genetic integrity of wild populations. It is important to note that many sublethal toxicological endpoints or biomarkers may harm fish in ways that are not readily apparent. When small changes in the health or performance of individual fish are observed (e.g. a small percentage change in the activity of a certain enzyme, an increase in oxygen consumption, the formation of pre-neoplastic hepatic lesions, etc.), it may not be possible to infer a significant loss of essential behavior patterns of fish in the wild, even in circumstances where a significant loss could occur.

The analysis of direct impacts of herbicides on salmonids in this Opinion relates site-specific exposure conditions (i.e., expected environmental concentration, bioavailability, and exposure duration) to the known or suspected impacts of the chemical on the health of exposed fish. The analysis considers: (1) The life history stage (and any associated vulnerabilities) of the exposed salmonid; (2) the known or suspected mechanism of toxicity for the active ingredient or adjuvant in question; (3) local environmental conditions that may modify the relative toxicity of the contaminant; and (4) the possibility of additive or synergistic interactions with other chemicals that may enter surface waters as a result of parallel or upstream land use activities.

Table 6. Herbicide Movement Rating†

Herbicide	Herbicide Movement Rating	Soil Half-Life (days)	Water Solubility (mg/l)	Sorption Coefficient (soil Koc)
Clopyralid	Very High	40	300,000	6
Glyphosate	Very Low	47	900,000	24,000
Picloram	Very High	90	200,000	16
2,4-D	Moderate	10	100	100
Sulfometuron-Methyl	Moderate	20	70	78
Metsulfuron-Methyl	High	30	9500	35
Dicamba	Very High	14	400,000	2
Imazapic	Moderate-High‡	113	3,600‡	206‡

† From Vogue et al. (1994); This database relies heavily on the SCS/ARS/CES Pesticide Properties Database for Environmental Decision Making (Wauchope et al., 1992).
‡From Tu et al. (2001).

A probabilistic risk assessment (PRA), based on the relationship between the likelihood of exposure and the magnitude of effect is used to determine the likelihood that the proposed herbicide use would "harm" listed salmon or steelhead. Traditionally, a PRA incorporates data from a standard exposure study of the lethal concentration that kills half of a test population (LC_{50}), as well as chronic exposure data to predict the sensitivity of an organism to the pesticide or chemical. The lethality endpoint has little predictive value for assessing whether pesticide exposure will cause sublethal neurological and behavioral disorders in wild salmon (Scholz et. al 2000), but in most cases, the LC_{50} is the only toxicity data available. Although little information is available on the sublethal effects of the herbicides on listed fish, there can be subtle sublethal effects that can potentially affect the survival or reproduction of large population segments. For example, Scholz et al. (2000), Moore and Waring (1996) indicate that environmentally relevant exposures to diazinon can disrupt olfactory capacity in the context of survival and reproductive success of chinook salmon, both of which are key management considerations under the ESA (Scholz et al. 2000). The likelihood of similar effects with the chemicals proposed for use is unknown.

Based on the analysis provided in the BA, and available literature, it appears unlikely that the proposed herbicide use would cause outright fish kills at concentrations of the active ingredients likely to occur in water from the proposed action. In rare circumstances, high concentrations of herbicides could wash into streams from rainfalls shortly after herbicides are applied along road ditches or other surfaces that rapidly generate overland flows, or as a result of an accidental spill. In such instances, localized fish kills could occur, particularly in small tributary streams where the contaminated flows would not be readily diluted. All LC_{50}s for salmonids with the active ingredients in the herbicides proposed for use are above 1 mg/L (see Appendix A).

Environmental concentrations, as a result of the proposed action, would typically be at least one to two orders of magnitude lower than the reported LC_{50}s. However, while the active ingredients pose a low risk of mortality, the product formulations sometimes include unspecified inactive ingredients and adjuvants with unknown toxic effects on listed fish. In one notable example, the surfactant in the product Roundup (Roundup is not proposed for use in this action), causes the formulation to be extremely toxic to salmonids, while the product Rodeo, which contains the same active ingredient (glyphosate), but no surfactants, has very low toxicity (SERA 1996).

Although outright mortality from exposure to herbicides from the proposed action is unlikely (with rare exceptions noted above), listed fish are likely to be exposed to herbicide concentrations where sublethal effects could occur. The consequences of many sublethal effects are uncertain, but the loss or impairment of physiological or behavioral functions from sublethal exposures can adversely affect the survival, reproductive success, or migratory behavior of individual fish. Such effects, in turn, can be expected to reduce the viability of wild populations. Weis et al. (2001) reviewed published literature on consequences of changes in behavior of fish from exposure to contaminants, and noted studies reporting impaired growth and population declines from altered feeding behavior, and impaired predator avoidance. Potential sublethal effects, such as those leading to a shortened lifespan, reduced reproductive output, or other deleterious biological outcomes are a threat to listed species from the proposed action. Anadromous fish in the Snake River are exposed to multiple physiological sublethal stressors with apparent cumulative effects (e.g. Ebel et al. 1975; Matthews et al. 1986; Coutant 1999). Cumulative exposure to multiple sublethal stressors associated with the Snake River hydropower system has been attributed to delayed mortality in Snake River salmon (Budy et al. 2002). Mortality resulting from a history of multiple physiologically sublethal stressors is referred to as “ecological death” (Kruzynski et al. 1994; Kruzynski and Birtwell 1994). Cumulative effects of multiple stressors are thought to be the cause of declines in some fish populations, even though the effects of any single stressor appeared to be insignificant (Korman et al. 1994; Vaughan et al. 1984). Although exposure to pesticides is not a reported factor in delayed mortality of fish, one can reasonably assume that physiological stress created from sublethal exposure to herbicides would contribute to effects of other stressors attributed to delayed mortality in fish.

The toxicological endpoints identified below are possible for a variety of pesticides and are generally considered to be important for the fitness of salmonids and other fish species. They include:

- Direct mortality at any life history stage.
- An increase or decrease in growth.
- Changes in reproductive behavior.
- A reduction in the number of eggs produced, eggs fertilized, or eggs hatched.
- Developmental abnormalities, including behavioral deficits or physical deformities.
- Reduced ability to osmoregulate or adapt to salinity gradients.
- Reduced ability to tolerate shifts in other environmental variables (*e.g*. temperature or increased stress).
- An increased susceptibility to disease.
- An increased susceptibility to predation.
- Changes in migratory behavior.

Most of these endpoints (above) have not been investigated for the herbicides used in the proposed action. Available information on lethal and sublethal effects are summarized in the Risk Assessment section, below.

d. Likelihood of Indirect Effects

Indirect effects of pesticides can occur through their effects on the aquatic environment and non-target species. The likelihood of adverse indirect effects is dependent on environmental concentrations, bioavailability of the chemical, and persistence of the herbicide in salmon habitat. For most pesticides, including the chemicals in the proposed action, there is little information available on environmental effects, such as negative impacts on primary production, nutrient dynamics, or the trophic structure of macroinvertebrate communities. Most available information on potential environmental effects must be inferred from laboratory assays; however, a few observations of environmental effects are reported in the literature. Due to the paucity of information, there are uncertainties associated with the following factors: (1) The fate of herbicides in streams; (2) the resiliency and recovery of aquatic communities; (3) the site-specific foraging habits of salmonids and the vulnerability of key prey taxa; (4) the effects of pesticide mixtures that include adjuvants or other ingredients that may affect species differently than the active ingredient; and (5) the mitigating or exacerbating effects of local environmental conditions. Where uncertainties cannot be resolved using the best available scientific literature, the benefit of the doubt should be given to the threatened or endangered species in question [H.R. Conf. Rep. No. 697, 96th Cong., 2nd Sess. 12 (1979)].

It is becoming increasingly evident that indirect effects of contaminants on ecosystem structure and function are a key factor in determining a toxicant's cumulative risk to aquatic organisms (Preston 2002). Moreover, aquatic plants and macroinvertebrates are generally more sensitive than fish to the acutely toxic effects of herbicides. Therefore, chemicals can potentially impact the structure of aquatic communities at concentrations that fall below the threshold for direct impairment in salmonids. The integrity of the aquatic food chain is an essential biological requirement for salmonids, and the possibility that herbicide applications will limit the productivity of streams and rivers should be considered in an adverse effects analysis.

The potential effects of herbicides on prey species for salmonids are also an important concern. Juvenile Pacific salmon feed on a diverse array of aquatic macroinvertebrates (i.e. larger than 595 microns in their later instars or mature forms; Cederholm et al. 2000). Terrestrial insects, aquatic insects, and crustaceans comprise the large majority of the diets of fry and parr in all salmon species (Higgs et al. 1995). Prominent taxonomic groups include Chironomidae (midges), Ephemeroptera (mayflies), Plecoptera (stoneflies), Tricoptera (caddisflies), and Simuliidae (blackfly larvae) as well as amphipods, harpacticoid copepods, and daphniids. Chironomids in particular are an important component of the diet of nearly all freshwater salmon fry (Higgs et al. 1995). In general, insects and crustaceans are more acutely sensitive to the toxic effects of environmental contaminants than fish or other vertebrates. However, with a few exceptions (e.g. daphniids), the impacts of pesticides on salmonid prey taxa have not been widely investigated. Where acute toxicity for salmonid prey species are available, however, they should be used to estimate the potential impacts of herbicide applications on the aquatic food chain.

Human activities that modify the physical or chemical characteristics of streams often lead to changes in the trophic system that ultimately reduce salmonid productivity (Bisson and Bilby, 1998). In the case of herbicides, a primary concern is the potential for impacts on benthic algae. Benthic algae are important primary producers in aquatic habitats, and are thought to be the principal source of energy in many mid-sized streams (Minshall, 1978; Vannote et al., 1980; Murphy, 1998). Herbicides can cause significant shifts in the composition of benthic algal communities at concentrations in the low parts per billion (Hoagland et al. 1996). Moreover, based on the data available, herbicides have a high potential to elicit significant effects on aquatic microorganisms at environmentally relevant concentrations (DeLorenzo et al. 2001). In many cases, however, the acute sensitivities of algal species to herbicides are not known. In addition, Hoagland et al. (1996) identify key uncertainties in the following areas: (1) The importance of environmental modifying factors such as light, temperature, pH, and nutrients; (2) interactive effects of herbicides where they occur as mixtures, (3) indirect community-level effects, (4) specific modes of action, (5) mechanisms of community and species recovery, and (6) mechanisms of tolerance by some taxa to some chemicals. Herbicide applications have the potential to impair autochthonous production and, by extension, undermine the trophic support for stream ecosystems. However, existing data gaps make it difficult to precisely estimate the degree of ecological risk, and limited information is available on the ecological effects of the chemicals in the proposed action.

The growth of salmonids in freshwater systems is largely determined by the availability of prey (Chapman 1966; Mundie 1974). For example, supplementation studies (e.g. Mason 1976) have shown a clear relationship between food abundance and the growth rate and biomass yield or productivity of juveniles in streams. Therefore, herbicide applications that kill or otherwise reduce the abundance of macroinvertebrates in streams can also reduce the energetic efficiency for growth in salmonids. Less food can also induce density-dependent effects, that is, competition among foragers can be expected to increase as prey resources are reduced (Ricker 1976). These considerations are important because juvenile growth is a critical determinant of freshwater and marine survival (Higgs et al. 1995). For example, a recent study on size-selective mortality in chinook salmon from the Snake River (Zabel and Williams 2002) found that naturally reared wild fish did not return to spawn if they were below a certain size threshold when they migrated to the ocean. There are two primary reasons mortality is higher among smaller salmonids. First, fish that have a slower rate of growth suffer size-selective predation during their first year in the marine environment (Parker 1971; Healey 1982; Holtby et al. 1990). Growth-related mortality occurs late in the first marine year and may determine, in part, the strength of the year class (Beamish and Mahnken 2001). Second, salmon that grow more slowly may be more vulnerable to starvation or exhaustion (Sogard 1997).

e. Risk Assessment for Effects of Herbicides on Salmon, Steelhead, and Their Environment

(1) Picloram Risk Assessment

Exposure. Picloram is extremely mobile in soil, but has a relatively short half-life in aerobic soils. Ismail and Kalihasan (1997) found that picloram moves rapidly out of the top 5 cm of soil with a half-life of about 4 to 10 days. Somewhat longer half-lives of 13 to 23 days have been reported by Krzyszowka et al. (1994). Generalized estimates of peak levels of picloram in water ranged between about 0.012 mg/L in sandy soil to 0.025 mg/L in clay soil water, applied at an application rate of 0.45 kg acid equivalents (a.e.) per acre, and modeled as transport directly into a pond (USDA 1989). Water concentrations expected from the proposed action would likely be far less than the concentrations modeled in USDA (1989). The application rate in the proposed action is one-fourth of the modeled rate, precipitation is 5 to 10 times lower than the modeled rate, chemicals would be diluted in a running stream in comparison to a pond, and no application of picloram is authorized within 100 feet of any stream.

Toxicity. Acute (96-hour) LC_{50} values for trout range from about 5 mg/L to about 20 mg/L, and chronic studies using reproductive or developmental parameters for trout report no-effect levels of 0.55 mg/L and adverse effects levels of 0.88 mg/L (SERA 1999a). The BA reported that the normal application of picloram at an application rate of 1 lb acid equivalents/acre (a.e./acre) is likely to result in long term water concentrations in the range of 0.01 to 0.06 mg/L in areas with substantial rainfall or as the result of accidents, consequently water concentrations are not expected to cause outright lethality or certain developmental and reproductive effects. Sublethal exposures of picloram were found to increase mortality by 70% of yearling coho salmon exposed to seawater (Lorz et al. 1979).

Most of the potential sub-lethal effects for picloram have not been investigated in regard to toxicological endpoints that are important to the overall health and fitness of salmonids (e.g., growth, life history, mortality, reproduction, adaptability to environment, migration, disease, predation, population viability). Sublethal effects concentrations reported in the literature vary. Woodward (1979) found that picloram concentrations greater than 0.61 mg/L decreased growth of cutthroat trout, and a similar finding was reported by Mayes (1984). Maximum exposure concentrations not affecting survival and growth of cutthroat trout ranged from 290 to 48 ug/L in Woodward's (1979) study. Tests with the early life-stages of rainbow trout showed that picloram concentrations of 0.9 mg/L reduced the length and weight of rainbow trout larvae, and concentrations of 2 mg/L reduced survival of the larval fish (Mayes et al. 1987). Woodward (1976), in a study of lake trout, found that picloram reduced fry survival, weight, and length at concentrations of 0.04 mg/L, and that the rate of yolk sac absorption and growth of lake trout fry was reduced in flow-through tests at concentrations as low as 0.35 mg/L. These effects were observed at water concentrations that may be encountered from the proposed action. Yearling coho salmon exposed to 5 mg/L of picloram for 6 days suffered "extensive degenerative changes" in the liver and wrinkling of cells in the gills (U.S. EPA 1979).

Indirect Effects on Aquatic Organisms. Although picloram is toxic to salmonids, it is not as toxic to daphnia or algae at the same concentrations. In *Daphnia*, the reported acute (48-hours) LC_{50} value is 68.3 (63 to 75) mg/L (SERA 1999a). Chronic studies using reproductive or developmental parameters in daphnia report a no-effect level of 11.8 mg/L and an adverse effect level of 18.1 mg/L. Based on standard bioassays in aquatic algae, the lowest effect level for the potassium salt of picloram (EC_{25} for growth inhibition *(S. capricornutum*) is 52.6 mg/L with a corresponding “no observable adverse effects level” of 13.1 mg/L.

Effects on Nontarget Plants. While most grasses are resistant to picloram, it is highly toxic to many broad-leafed plants. Picloram is persistent in the environment, and may exist at levels toxic to plants for more than a year after application at normal rates. In normal applications, nontarget plants may be exposed to chemical concentrations many times the levels that have been associated with toxic effects. Picloram's mobility allows it to pass from the soil to nearby, nontarget plants. It can also move from target plants, through roots, down into the soil, and into nearby nontarget plants. Given this capability, an applicator does not have to spray the buffer zone in order to affect the riparian vegetation. Spray drift may kill plants some distance away from the area being treated. Crop damage from irrigation water contaminated by picloram has been documented the U.S. Environmental Protection Agency (U.S. EPA 1995, USFS 1995).

(2) 2,4-D (amine salt only) Risk Assessment

Exposure. 2,4-D is soluble in water, but it rapidly degenerates in most soils, and is rapidly taken up in plants. 2,4-D ranges from being mobile to highly mobile in sand, silt, loam, clay loam, and sandy loam. Consequently, 2,4-D is likely to contaminate surface waters when rains occur shortly after application, but otherwise is likely to degrade or be taken up by plants before it reaches surface or ground water. The Washington Department of Ecology collected 32 stream samples downstream from a helicopter application of 2,4-D conducted according to Washington’s BMPs. The 2,4-D was found in all samples collected, in highest concentrations following a rainstorm the day after the spraying (Rashin and Graber 1993). In another study, 2,4-D was found in 19 of 20 basins sampled throughout the United States (USGS 1998). In the USGS (1998) study, 2,4-D was found in 12% of agricultural stream samples; 13.5% of urban stream samples; and in 9.5% of the samples from rivers draining a variety of land uses. The study by Rashin and Graber (1993) demonstrates a greater likelihood of 2,4-D contamination in an environment with frequent precipitation, while the broader USGS (1998) study shows lower rates of contamination when averaged across a range of climatic conditions.

Toxicity. In rainbow trout, tests of the 2,4-D dodecyl/tetradodecyl amine salt on several life stages yielded LC_{50}s of 3.2 mg/L for fingerlings, 1.4 mg/L for swim-up fry, 7.7 mg/L for yolk-sac fry, and 47 mg/L for eggs (USFWS 1980). For chinook salmon in the fingerling stage, tests of the dodecyl/tetradodecyl amine salt yielded a 96-hour LC_{50} of 4.8 mg/L and at the yolk-sac stage, a 96-hour LC_{50} yielded 2.9 mg/L (USGS 2001).

Most of the potential sub-lethal effects from exposure to 2,4-D have not been investigated for endpoints important to the overall health and fitness of salmonids. Exposure to 2,4-D has been reported to cause changes in schooling behavior, red blood cells, reduced growth, impaired ability to capture prey, and physiological stress (NIH 2002b; Gomez 1998; Cox 1999). Sublethal effects for the 2,4-D amine salt form include the reduction in the ability of rainbow trout to capture food at 5 mg/L (Cox 1999). 2,4-D can combine with other pesticides and have a synergistic effect, resulting in increased toxicity. Combining 2,4-D with picloram damages the cells of catfish (Ictalurus spp.) gills, although neither individual pesticide has been found to cause this damage (Cox 1999). Little et al. (1990) examined behavior of rainbow trout exposed for 96 hours to sublethal concentration of 2,4-D amine, and observed inhibited spontaneous swimming activity and swimming stamina.

Indirect Effects on Aquatic Organisms. The SERA (1998b) report suggests that amine and acid formulations have relatively low toxicity to aquatic invertebrates and aquatic plants, although the effects are highly variable. Insect larvae are most susceptible to adverse effects, while zooplankton are the least susceptible (Sarkar 1991). Acute toxicity tests exposing the cladoceran, *Simocephalus vetulus*, to the sodium salt of 2,4-D show complete mortality following 96 hours of exposure to concentrations ranging from 0.5 to 5.0 mM (Kaniewska-Prus 1975). Using a molecular weight of 221 for 2,4-D acid, these levels correspond to 0.1105 to 1.105 grams a.e./L. The U.S. EPA (1989) reported for the dimethylamine salt, a LC_{50} for grass shrimp of 0.2 mg/L. SERA (1998b) concluded that some species of aquatic algae are sensitive to concentrations of approximately 1 mg/L 2,4-D, however, low levels of the compound may stimulate algal growth in some species. Ester formulations have much greater toxicity, but are not proposed for use by the BLM.

(3) Glyphosate Risk Assessment (Rodeo formulation only)

Exposure. Glyphosate is strongly adsorbed to most soils, and dissolves easily in water. The potential for leaching is low due to the soil adsorption, however, glyphosate can move into surface water when the soil particles to which it is bound are washed into streams or rivers (U.S. EPA 1993). Studies examined glyphosate residues in surface water after forest application in British Columbia with and without no-spray streamside zones. With a no-spray streamside zone, very low concentrations were sometimes found in water and sediment after the first heavy rain.

Biodegradation represents the major dissipation process. After glyphosate was sprayed over two streams in the rainy coastal watershed of British Columbia, glyphosate levels in the streams rose dramatically after the first rain event, 27 hour post application, and fell to undectable levels in 96 hours (NIH 2002a). The highest residues were associated with sediments, indicating that they were the major sink for glyphosate. Residues persisted throughout the 171 day monitoring period. Suspended sediment is not a major mechanism for glyphosate transport in rivers.

Toxicity. Reported tests of glyphosate (technical grade or formulations without surfactants) toxicity to fish for 24- to 96-hour LC_{50} values range from approximately 10 mg/L at a pH of 6, to >200 mg/L at a pH of 10 (Smith and Oehme 1992; EPA 1993). Technical glyphosate acid (parent compound) is "practically nontoxic" to fish. The 96-hour LC_{50} for technical grade glyphosate in rainbow trout ranges from 1.3 mg/L (USGS 2002), to a range of 86-140 mg/L reported in SERA (1996). The results of a rainbow trout yolk-sac 96-hour LC_{50} static bioassay ranged from 3.4-5.3 mg/L (USGS 2002). The 2003 weed BA reported that environmental concentrations of glyphosate from the proposed action would not exceed 1 mg/L, which is near the low end of the 96 hour LC_{50} for adults, and one-third the LC_{50} concentration for trout yolk-sac stage.

Information on sublethal effects of glyphosate is available for many of the endpoints important to the overall health and fitness of salmonids; and of those reported, glyphosate appears to carry a low risk for sublethal effects (SERA 1996).

Indirect Effects on Aquatic Organisms. Glyphosate is highly toxic to all types of terrestrial plants and is used to kill floating and emergent aquatic vegetation. Glyphosate does not appear to have similar toxicity to algae. Glyphosate is considered by EPA to be “slightly toxic” to aquatic invertebrates (SERA 1996). LC_{50} values of 780 and 930 mg/L have been reported for daphnia. Hildebrand et al. (1980) found that Roundup treatments at concentrations up to 220 kg/ha did not significantly affect the survival of daphnia or its food base of diatoms under laboratory conditions. In addition, Simenstad et al. (1996) found no significant differences between benthic communities of algae and invertebrates on untreated mudflats and mudflats treated with Rodeo. It appears that under most conditions, rapid dissipation from aquatic environments of even the most toxic glyphosate formulations prevents build-up of herbicide concentrations that would be lethal to most aquatic species.

(4) Clopyralid Risk Assessment

Exposure. Clopyralid is stable in water over a pH range of 5 to 9 (Woodburn 1987) and the rate of hydrolysis in water is extremely slow, with a half-life of 261 days (Concha and Shepler 1994). In addition, clopyralid is extremely stable in anaerobic sediments, with no significant decay noted over a one year period (Hawes and Erhardt-Zabik 1995). Clopyralid does not bind tightly to soil and thus would seem to have a high potential for leaching. While clopyralid will leach under conditions that favor leaching, such as sandy soil, a sparse microbial population, and high rainfall, the potential for leaching or runoff is functionally reduced by the relatively rapid microbial degradation of clopyralid in soil (e.g. Baloch-Haq et al. 1993; Bergstrom et al. 1991; Bovey and Richardson 1991). A number of field lysimeter studies and the long-term field study by Rice et al. (1997)

indicate that leaching and subsequent contamination of ground water are likely to be minimal. This conclusion is also consistent with a short-term monitoring study of clopyralid in surface water after aerial application (Leitch and Fagg 1985).

Toxicity. Little information is reported for toxic effects of Clopyralid. A 96-hour LC_{50} assay using an unspecified life stage of rainbow trout was 103 mg a.e./L (SERA 1999b). No information is available on sublethal effects.

Indirect Effects on Aquatic Organisms. From information reported in SERA (1999b) it appears that there could be potential losses in primary productivity from algae killed by clopyralid, based on an EC_{50} for algae of 6.9 mg/L. However, concentrations lethal to algae are unlikely to occur unless clopyralid is directly added to water, or if a rainfall washes the chemical into a stream shortly after it is applied. Toxic effects on aquatic invertebrates are reported only for daphnia, which has an LC_{50} of 350 mg a.e./L for the monoamine salt and 232 mg a.e./L for the acid LC_{50}. If other invertebrates respond similarly to daphnia, then lethal effects on aquatic invertebrates are unlikely.

(5) Sulfometuron-methyl Risk Assessment

Exposure. Sulfometuron-methyl has a half-life of one month or less in anaerobic freshwater environments, and four months in sterile soils (SERA 1999a). Application rates of 5.76 ounces of active ingredient (a.i) per acre resulted in concentrations of 0.02 (0.005-0.04) mg/L occurring in the ambient water immediately after a major rainfall (USDA 1999). When adjusted for application rates of 1.6 ounces a.e. per acre (0.1 lb a.e./acre), the expected levels of sulfometuron-methyl in ambient water would be 0.005 (0.001 - 0.01) mg/L, which is 100 times lower than the concentration where mortality of bluegill sunfish or flathead minnows was reported.

At least one percent of the applied sulfometuron-methyl applied to an area could run off from the application site to adjoining areas after a moderate rain, based on studies of runoff from 84 mm of total rainfall (43 mm/hour for 2 hours) by Hubbard et al. (1989) and from 12 to 30 mm of rain rainfall by Wauchope et al. (1990). In the case of a heavy rain, losses could be much greater and might approach 50% in cases of extremely heavy rain and a steep soil slope (SERA 1999a).

Toxicity. In rainbow trout, no mortality was observed in 96 hour assays at concentrations up to 12.5 mg/L (SERA 1998a). Sulfometuron-methyl had no effect on hatchability, growth, or survival of flathead minnow eggs or fry, at concentrations of 1.17 mg active ingredient (a.i.)/L (SERA 1998a). Potential chronic effects of sulfometuron-methyl at concentrations between 1.17 mg a.i./L and 100 mg a.i./L cannot be dismissed but long-term exposure to greater than 1 mg a.i./L sulfometuron-methyl is unlikely (SERA 1998a). Lethal effects in fish are not likely to be observed at a concentration less than or equal to 150 mg/L. The lowest concentration at which mortality was observed in any species of fish is 1.25 mg/L. At this level, mortality was observed in one out of 10 bluegill sunfish. No mortality, however, was observed in 10 bluegills exposed to 12.5 mg/L (Muska and Hall 1980).

The SERA (1998a) assessment concludes that "there is no evidence that concentrations of sulfometuron-methyl in the range of those likely to be found in ambient water after any plausible application program or those that might occur after a spill will cause adverse (lethal) effects in fish or aquatic invertebrates." However, a fish kill from Dicamba occurred when the Tennessee Department of Transportation sprayed about 6,000 acres of road right-of-ways, prior to heavy rains that followed the spraying (Cox 1994).

Based on assays of flathead minnow hatch, larval survival, or larval growth over 30-day exposure periods, no adverse effects would be expected at concentrations up to 1.17 mg sulfometuron- methyl (SERA 1998a). No other information on sub-lethal effects of the product Oust, or sulfometuron-methyl on listed fish was found in available literature. Sub-lethal effects were reported for daphnia and flathead minnow.

Indirect Effects on Aquatic Organisms. Sulfometuron-methyl appears to be relatively non-toxic to aquatic invertebrates. The LC_{50} values reported in SERA (1998a) for daphnids, crayfish, and field-collected species of other aquatic invertebrates are all above 802 mg/L, some by more than a factor of 10. No daphnid mortality was reported for groups exposed to concentrations of up to 12.5 mg/L. One daphnid reproduction study noted a reduction in the number of neonates at 24 mg/L, but not at 97 mg/L or at any of the lower concentrations tested.

Aquatic plants are far more sensitive than aquatic invertebrates, although there appears to be substantial differences in sensitivity among species of macrophytes and unicellular algae. There are no published or unpublished data known regarding the toxicity of sulfometuron-methyl to aquatic bacteria or fungi. By analogy to the effects on terrestrial bacteria and aquatic algae, it seems plausible that aquatic bacteria and fungi will be sensitive to the effects of sulfometuron-methyl. Primary production is likely to be reduced in places where sulfometuron-methyl reaches water. The USDA (1999) observed water concentrations, after a rainfall, that were 1 to 2 orders of magnitude higher than the EC_{50} concentrations for some algae. The EC_{50} concentration for the freshwater algae *Senenstrum capriconutum* was 4.6 μg a.i./L in a 120-hour EC_{50} based on a reduction in cell density relative to controls (Hoberg 1990). The EC_{50} values for other freshwater algal species are generally greater than 10 μg/L, depending on the endpoint assayed (Landstein et al. 1993), but still fall in a range of concentrations that are likely to occur after a rainfall. It is plausible that sulfometuron-methyl contamination of water will cause adverse effects (i.e., reduction in growth and biomass) in sensitive aquatic macrophytes and algal species.

(6) Imazapic Risk Assessment

Exposure. A study by Ta (1994) identified a soil half-time of 113 days. Simulations of imazapic were conducted for both clay, loam, and sand at annual rainfall rates from 5 to 250 inches and the typical application rate of 0.0624 lb a.e./acre (SERA 2001). Based on the modeling, under arid conditions (i.e., annual rainfall of about 10 inches or less), no runoff is expected, and degradation, not dispersion, accounts for the decrease of imazapic concentrations in soil. At higher rainfall rates, plausible offsite movement of imazapic result in runoff losses that range from about 0.01 to 0.45 of the application rate, depending primarily on the amount of rainfall rather than differences in soil type. In very arid environments substantial contamination of water is unlikely. In areas with increasing levels of rainfall, exposures to aquatic organisms are more likely to occur. Thus, the anticipated concentrations in ambient water encompass a very broad range, 0.00003 to 0.0114 mg/L, depending primarily on differences in rainfall rates (SERA 2001).

Toxicity. Aquatic animals appear to be relatively insensitive to imazapic exposures, with LC_{50} values >100 mg/L for both acute toxicity and reproductive effects. In acute toxicity studies, all tested species (channel catfish, bluegill, sunfish, trout, and sheepshead minnow) evidenced 96-hour LC_{50} values of >100 mg/L - i.e., nominal concentration of 100 mg/L caused less than 50% mortality over the 96-hour exposure period (SERA 2001). The low toxicity of imazapic to fish is probably related to very low rate of uptake of this compound by fish. In a 28-day flow-through assay, the bioconcentration of imazapic was measured at 0.11 L/kg (Barker et al. 1998) indicating that the concentration of imazapic in the water was greater than the concentration of the compound in fish.

No studies are reported in the SERA assessment for sub-lethal effects of imazapic for listed fish. Barker et al. (1998) observed no effects on reproductive parameters in a 32-day egg and fry study using flathead minnow.

Indirect Effects on Aquatic Organisms. Relatively little information is available indicating the effects of imazapic on aquatic organisms in the natural environment. No adverse effects to *Daphnia* or mysid shrimp were observed at nominal concentrations of imazapic of up to 100 mg/L in 96-hour studies (SERA 2001); however the report did not specify if the analysis included any sublethal endpoints. Effects of imazapic on aquatic plants is highly variable. *Lemna gibba*, a freshwater macrophyte, is the most sensitive aquatic plant reported in the literature, with an EC_{25} value based on decreased frond counts, of 0.00423 mg/L. Algaes were less sensitive than macrophytes (reported LC_{50} values > 0.045 mg/L), and responses included both growth inhibition and growth stimulation (SERA 2001).

(7) Dicamba Risk Assessment

Exposure. In soil, dicamba is very mobile because it is poorly adsorbed to most soils. Dicamba is also readily soluble in water, so its transport is influenced by precipitation. At low rainfall rates, dicamba dissipation had a half time of about 20 days. At high rainfall rates using modeled runs, virtually all the dicamba was washed from the soil. As detailed in (SERA 1995), the environmental fate of dicamba has been extensively studied. In general, dicamba is very mobile in most soil types. Because of the relatively low ko/c, dicamba is poorly adsorbed to most soil types. The only reported exception this generalization is peat, to which dicamba is strongly adsorbed (Grover and Smith 1974). For many soil types, the extent of soil adsorption is positively correlated with and can be predicted from the organic matter content and exchangeable acidity of the soil (Johnson and Sims 1993). In a monitoring study by Scifres and Allen (1973), dicamba levels in the top 15 cm of soil dissipated at a rate of about 0.22 day-1 (t1/2=3.3 days) over the first two weeks following application. After 14 days, no dicamba was detected, with the limit of detection of 0.01 μg/g, in the top 15 cm of soils and residues at all depths were less than 0.1 μg/g. The rates of dissipation in clay and loam were essentially identical.

Available monitoring data indicate that ambient water may be contaminated with dicamba after standard applications of the product. The range of average to maximum dicamba levels in water reported in a monitoring study by Waite et al. (1992) are from 0.1 to 0.4 μg/L. SERA (1995) characterized the water concentration of dicamba in a severe spill as approximately 10 mg/L, which could result in some fish mortality.

Toxicity. There is wide variation in the reported acute toxicity of dicamba to fish, with 24-hour LC_{50} values ranging from 28 mg/L to more than 500 mg/L. Most laboratory assays in SERA (1995) reported LC_{50} values >100 mg/L. In bluegill sunfish, the standard 96 hour LC_{50} is 600 mg/L, but when the herbicide was adsorbed onto vermiculite, the LC_{50} dropped to around 20 mg/L (USDA 1984). In a study by Lorz et al. (1979), yearling coho mortality was observed at 0.25 mg/L during a seawater challenge test which simulates their migration from rivers to the ocean. An LC_{50} of 28 mg/L in trout was reported by Johnson and Finley (1980). Little is known about effects on fish other than acute toxicity.

Indirect Effects on Aquatic Organisms. The range of toxicity values of dicamba to aquatic invertebrates suggests wide variation among species. Consequently, available assays provide little insight about the toxicity of dicamba to invertebrate species consumed by listed salmon and steelhead. Seed shrimp, glass shrimp, and fiddler crabs are killed by concentrations over 100 mg/L, while *Daphnia* and amphipods are killed by concentrations in the range of 3.9 - 11 mg/L (Cox 1994). The low end of this range is several orders of magnitude higher than water concentrations observed by Waite et al. (1992), but within the range of concentrations SERA (1995) describes for a moderate to severe spill.

Sublethal effects on aquatic invertebrates are unknown. The only endpoints that have been examined are acute lethal responses for aquatic animals (LC_{50} values) and growth inhibition in unicellular algae (EC_{50} values). Algae species are much more sensitive to dicamba than fish (SERA 1995).

(8) Metsulfuron-methyl Risk Assessment

Exposure. The half-life of metsulfuron-methyl ranges from 120 to 180 days (in silt loam soil). Metsulfuron-methyl remains unchanged in the soil for varying lengths of time, depending on soil texture, pH and organic matter content. There are major areas of uncertainty and variability in assessing potential levels of exposure in soil. In general, metsulfuron-methyl absorption to a variety of different soil types will increase as the pH decreases (i.e., the soil becomes more acidic). The persistence of metsulfuron-methyl in soil is highly variable, and reported soil half-times range from a few days to several months, depending on factors like temperature, rainfall, pH, organic matter, and soil depth. Off-site movement of metsulfuron-methyl is governed by the binding of metsulfuron-methyl to soil, the persistence of metsulfuron-methyl in soil, as well as site-specific topographical, climatic, and hydrological conditions. Fate and transport simulations reported in SERA (2000) were conducted for clay and sand at annual rainfall rates ranging from 5 to 250 inches and the typical application rate of 0.02 lb a.i./acre. In sand or clay under arid conditions (i.e., annual rainfall of about 10 inches or less) there is no percolation or runoff and the rate of decrease of metsulfuron-methyl concentrations in soil is attributable solely to degradation rather than dispersion. At higher rainfall rates, plausible concentrations in soil range as high as 0.007 mg/L, and under a variety of conditions, concentrations of 0.0005 mg/L and greater may be anticipated in the root zone for appreciable periods of time. Metsulfuron-methyl exposure to aquatic species is affected by the same factors that influence terrestrial plants, except the directions of the impact are reversed. In very arid environments (i.e., where the greatest persistence in soil is expected) substantial contaminations of water is unlikely. In areas with increasing levels of rainfall, toxicologically significant exposure to aquatic plants are more likely to occur. As summarized in SERA (2000), peak water levels of about 0.003 to 0.006 mg/L can be anticipated under worst case conditions at rainfall rates of 25 to 50 inches per year after a single application.

Toxicity. Metsulfuron-methyl is non-lethal to fish at the peak concentrations likely to be encountered by listed salmon and steelhead, and peak concentrations are many orders of magnitude lower than the concentrations where various sub-lethal effects were observed in rainbow trout. Metsulfuron-methyl does not bioaccumulate in fish. The lowest concentration at which mortality was observed in any species of fish is 100 mg/L for rainbow trout; however, in the same study, no mortality was observed in fish exposed to 1000 mg/L (Hall 1984). SERA (2000) concluded that mortality is not likely to occur in fish exposed to metsulfuron-methyl concentrations less than or equal to 1000 mg/L.

Debilitating sublethal effects (erratic swimming, rapid breathing, and lying on the bottom of the test container) were observed by Muska and Hall (1982) after exposure to 150 mg/L for 24 hours. In tests with rainbow trout, no significant long-term effects (90-day exposure) were observed by Kreamer (1996) on hatch rate, last day of hatching, first day of swim-up, larval survival, and larval growth at concentrations up to 4.7 mg/L. Concentrations greater than 8 mg/L resulted in small but significant decreases in hatching and survival of fry.

Indirect Effects on Aquatic Organisms. Toxicity studies on aquatic invertebrates are reported only for *Daphnia*, which has an acute LC_{50} value for immobility of 720 mg/L and a no observable effect concentration (NOEC) for reproduction of 150 mg/L (SERA 2000). The only effect reported by Hutton (1989) in a 21-day *Daphnia* study was a decrease in growth at concentrations as low as 5.1 mg/L, but decreased growth at concentrations less than 30 mg/L was not statistically significant. In aquatic invertebrates, decreased growth appears to be the most sensitive endpoint. Wei et al. (1999) report that neither metsulfuron-methyl nor its degradation products are acutely toxic to *Daphnia* at concentrations that approach the solubility of the compounds in water at pH 7. Although the results of *Daphnia* studies suggest that metsulfuron-methyl is relatively non-toxic to invertebrates, toxic effects concentrations for different invertebrate species often vary widely, as seen in several herbicides reviewed in this Opinion. Consequently, given the limited data available on invertebrate effects, there is insufficient information to draw any conclusion about the toxicity of metsulfuron-methyl on invertebrates consumed as prey by listed salmon and steelhead.

There are substantial differences in sensitivity to effects of metsulfuron-methyl among algal species, but all EC_{50} values reported in SERA (2000) are above 0.01 mg/L, and some values are substantially higher. Toxicity in algae increases with lower pH, most probably because of decreased ionization leading to more rapid uptake. At a concentration of 0.003 mg/L, metsulfuron-methyl was associated with a 6-16% inhibition (not statistically significant) in algal growth rates for three species but stimulation of growth was observed in *Selenastrum capricornutum* and the aquatic macrophyte, duckweed (SERA 2000). Wei et al. (1998; 1999) assayed the toxicity of metsulfuron-methyl degradation products in *Chlorella pyrenoidosa*, and found that the acute toxicity of the degradation products was about 2-3 times less than that of metsulfuron-methyl itself in a 96 hour assay. One field study cited in SERA (2000) on the effects of metsulfuron-methyl in algal species found that concentrations of metsulfuron-methyl as high as 1 mg/L are associated with only slight and transient effects on plankton communities in a forest lake.

f. Physical Effects of Herbicides on Watershed and Stream Functions

The use of herbicides can affect watershed or stream functions through the removal of vegetation and exposing bare soil. For boom spraying, and hand and spot applications, the potential for significant increases in erosion or water yield is limited because treatments would consist of small, scattered areas, and vegetation would typically be reestablished within a few months to a year. Aerial application could potentially affect large contiguous areas, that could be large enough to increase water yield or sediment delivery; however, the areas proposed for aerial application are some of the driest sites, mostly benches that seldom experience overland flow, and are typically drained by ephemeral channels. The proposed no-spray buffer strips and other BMPs should minimize the effects of drift, chemical leaching, or other effects of weed spraying on riparian vegetation.

No measurable adverse effects to peak/base flow, water yield, or sediment yield are likely to occur from implementation of noxious weed control and rehabilitation measures. Removal of solid stands of noxious weed vegetation by chemical treatment may result in short-term, negligible increases in surface erosion that would diminish as desired vegetation re-occupies the treated site. Only ground based spot/selective spraying will be authorized within riparian areas or within 100 feet of live water (whichever is larger). This will significantly reduce risks associated with spraying of non-target riparian vegetation. Noxious weed control measures will reduce weed competition with native riparian species and other upland species. Herbicide spraying in riparian areas will be minimal and will primarily be associated with spot spraying along road right-of-ways, and spot spraying of small patches of noxious weeds or individual plants. No aerial application of herbicides will be authorized within 200 feet of the outer edge of riparian areas for fish bearing streams or within 100 to 150 feet of the outer edge of the riparian areas for non-fish bearing streams. During 2003, no aerial application will occur in any Riparian Conservation Habitat Areas.

g. Summary of Herbicide Effects

Depending on the herbicide and location where it is used, the proposed action could adversely affect listed salmon and steelhead through lethal or sub-lethal effects, through alteration of the food web from toxic chemical effects, loss of desired riparian vegetation from contact with herbicides, or beneficially affect listed salmon and steelhead through restoration of native vegetation or more naturally-functioning watershed processes no longer impaired by infestations of invasive weeds.

The risk of harm to listed salmon and steelhead from contact with herbicides is a function of chemical concentration to which listed fish are exposed, and the toxicity of the chemical. Available literature cited above indicates that expected levels of herbicide exposure are likely to be well-below levels where the herbicides kill outright listed salmon or steelhead once they matured beyond the fry stage. This conclusion is based on the fact that reported thresholds for mortality are at least 1 to 2 orders of magnitude higher than likely herbicide concentrations in water resulting from the proposed action (with the exception of severe chemical spills). In instances where toxic effects were reported for various life stages, salmonid eggs and fry appear to be generally more sensitive to toxic effects than older life stages. Reported concentrations where mortality was observed in these early stages approach the range of concentrations that could occur in the action area. Herbicide spraying in the vicinity of steelhead or salmon eggs or fry could result in direct mortality if chemicals are sprayed into the water, or if rainfall occurs shortly after application, particularly when spraying roadside ditches. The relatively small amount of area treated within a given watershed, use of BMPs to reduce the likelihood of exposure, and the dilute concentrations proposed for use reduce the probability that direct mortality would occur from chemical exposure.

Although outright mortality from herbicide exposure is not expected to occur, adverse effects reported in sub-lethal assays include reductions in reproductive success, weight loss, physiological effects (endocrine system, blood chemistry, liver function, etc.), and reductions in growth, prey capture ability, and swimming ability, all of which are associated with reduced survival. Information available on sub-lethal effects of all herbicides proposed for use is incomplete and completely lacking for some chemicals. Few herbicide formulations have been thoroughly tested for sublethal effects on salmon or steelhead. There are no field studies available that evaluated potential effects of the herbicides used in the proposed action on aquatic productivity or invertebrate prey species found in Idaho streams. Consequently, the extent and likelihood of harmful sub-lethal effects or changes to the invertebrate prey base is unknown, and these effects could occur under the proposed action.

Given the presence of listed fish in the action area, the range of soil properties in the action area, chemicals proposed for use, rainfall patterns, and proposed spray activities, it is likely that circumstances will arise where herbicide concentrations in water will reach levels where delayed mortality or reduced reproductive success could occur. Such circumstances would arise in isolated instances when various combinations of factors occur, such as: Use of chemicals that persist in the environment for several months or longer; conditions that allow chemicals to move rapidly through soils; when precipitation occurs before the chemicals break down, bind to soil particles, or get taken up by plants; where listed fish or redds are in the vicinity of a spray site; or where the amount of chemical applied to an area is great enough to reach concentrations that could harm listed fish. Specific locations where harm is likely to occur from the proposed action cannot be identified at this time, since most of the above factors will not be known until spray sites are selected.

Changes in vegetation from weed spraying or other control methods can beneficially or adversely affect riparian and watershed functions. Adverse effects have been reported in instances where herbicides killed non-target plants, particularly riparian trees killed as a result of spray drift or uptake by roots. Beneficial effects to aquatic systems from noxious weed control are not well-documented, but could conceivably occur in circumstances where weed treatments kill exotic plants that would otherwise create a disclimax riparian plant community or displace native plants that provide shade, cover, habitat complexity, streambank stability, or recruitment of terrestrial invertebrate prey. In some drier portions of the action area, exotic weeds have almost completely displaced native grasses and forbs. In these areas, fire frequency, fire behavior, ground cover characteristics, and watershed hydrology are all likely to be altered by weeds, and effective weed control could reduce or eliminate these adverse effects.

2. Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." Other activities within the watershed have the potential to adversely affect the listed species and critical habitat within the action area. Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being reviewed through separate section 7 consultation processes. Past Federal actions have already been added to the environmental baseline in the action area.

The BA described a moderate to high risk for cumulative effects from activities occurring on private and state lands in the action area. The BLM lands in the action area are commonly interspersed with state and privately-owned lands, with non-Federal lands typically comprising the majority of the watershed acreage. Land use within the analysis area includes agricultural, timber harvest, roads, development, recreation, mining, and livestock grazing. Current levels of these uses are likely to continue, but detailed information on non-Federal activities in the action area are not available.

Livestock grazing may partially thwart weed control efforts. Cattle can spread weeds through their droppings, and create conditions that increase the likelihood that invasive weeds will out-compete native plants. Riparian cattle grazing on non-Federal lands is likely to cumulatively affect water temperature and water quality in portions of the action area.

Impaired water quality from on-going agricultural activities is likely to be one of the largest cumulative effects present in the action area. Cultivated croplands are likely to produce large amounts of sediment and increase water yield, and relatively large amounts of pesticides are also likely to be applied to croplands in the action area. City, state, and county governments also have on-going weed spraying programs with less-stringent measures to prevent water contamination. Weeds are sprayed along road right-of-ways annually by city, state, and county transportation departments, sometimes several times a year. NOAA Fisheries staff have observed county road crews spraying herbicides on streambank vegetation and directly into the water in Clearwater and Idaho Counties, and it is probable that similar practices will continue.

Part of the action area (in the Lower Salmon River subbasin) is governed under a cooperative weed management plan that encourages extensive use of herbicides by state, private and Federal agencies in the planning area. Any herbicide contamination that occurs from the proposed BLM action could potentially combine with contaminants from non-Federal activities, and contribute to formation of chemical mixtures or concentrations that could kill or harm listed steelhead or salmon. In addition, fish already stressed by elevated sediment and temperatures are more likely to susceptible to toxic effects of herbicides.

3. Consistency with Listed Species ESA Recovery Strategies

Recovery is defined by NOAA Fisheries regulations (50 CFR 402) as an "improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4 (a)(1) of the Act." Until the species-specific recovery plans are developed, the December 2000 Memorandum of Understanding Among Federal Agencies Concerning the Conservation of Threatened and Endangered Fish Species in the Columbia River Basin (Basinwide Salmon Recovery Strategy) provides the best guidance for judging the significance of an individual action relative to the species-level biological requirements. Where information is not available on the recovery needs of the species, either through recovery planning or otherwise, NOAA Fisheries applies a conservative approach that is likely to exceed what would be expected of an action if information were available.

Under the Basinwide Salmon Recovery Strategy, actions proposed by BLM must be consistent with PACFISH and Land and Resource Management Plan direction. There is no PACFISH direction related to use of herbicides. PACFISH goals establish an expectation that management will maintain or restore healthy, functioning watersheds, riparian areas, and associated fish habitat. The proposed action meets PACFISH goals to the extent that weed treatments restore natural riparian plant communities that have been altered by exotic plants, or to the extent that treatments prevent degradation of riparian communities by weed invasion.

4. Integration and Synthesis of Effects

NOAA Fisheries has determined that, when the effects of the proposed action are added to the environmental baseline and cumulative effects occurring in the action area given the status of the stocks and condition of critical habitat, the action is not likely to jeopardize the continued existence of the Snake River steelhead or Snake River spring/summer chinook salmon. Further, NOAA Fisheries concludes that the subject action would not likely result in the adverse modification or destruction of designated critical habitat for the Snake River spring/summer chinook salmon. In reaching these determinations, NOAA Fisheries used the best scientific and commercial data available. These determinations are based on the following considerations:

The proposed action is not likely to impair properly functioning habitat, not likely to appreciably reduce the functioning of already impaired habitat, and not likely to retard the long-term progress of impaired habitat toward PFC (all three conditions exist within the action area). Physical features of fish habitat such as stream channel and hydrologic attributes are not affected by the proposed action. The proposed action would have localized effects on riparian vegetation, through the intentional eradication of weeds and any incidental mortality of desired riparian plants exposed to herbicides. Weed control would help restore ecological functions of riparian communities where those functions have been impaired by invasion of exotic plants. Incidental losses of desired plants would be sporadic and localized in riparian areas since herbicides would be applied to individual plants, primarily by wicking or wiping. Any losses of non-target plants would generally involve only herbaceous species that could be reestablished within a few growing seasons. Aerial spraying carries the highest potential risks to non-target plants; however, wide buffers, low wind speeds, and spray droplet specifications substantially reduce the likelihood of herbicides affecting riparian vegetation (or drifting into water).

The principal effect of the proposed action on listed species is exposure to toxic chemicals. The proposed action includes precautionary measures to limit or avoid water contamination from herbicides. The scientific and commercial information reviewed in the BA and in the effects analysis of this Opinion indicates that possible herbicide concentrations instream under the proposed action are generally well-below concentrations lethal to salmon and steelhead. With the exception of rare circumstances (large spill of chemicals directly into water, or rainfall occurring immediately after herbicide application in close proximity to listed fish) outright mortality of listed fish is not expected to occur. This expectation could, however, be incorrect since little or no information is available concerning the toxicity of adjuvants and inert ingredients that are part of the herbicide formulations, and therefore has an unknown potential to kill listed fish outright from synergistic or additive effects of other chemicals in the aquatic environment.

Various sublethal effects on fish are reported for the herbicides evaluated in this Opinion, at concentrations that are likely to occur in the action area. However, it cannot be determined from the available information if the sublethal effects reported in the literature would “harm” listed fish through mortality at a later life stage, or reduced reproductive output. Information is lacking or incomplete for most potential sublethal effects, and sublethal effects thresholds are not predictable from the lethal assays (LC_{50}s) on which most toxicity studies are based. Sublethal effects thresholds of pesticides occur over a wide range of concentrations, including concentrations that are far-below herbicide concentrations likely to occur in the action area. From this information, we can infer that the likelihood of harm occurring from sublethal effects of the herbicides cannot be discounted; however the actual likelihood of harm occurring from the proposed action is unknown.

In spite of uncertainties regarding toxic effects of the herbicides, the likelihood of jeopardizing listed salmon or steelhead through harm from sublethal effects or outright mortality, is improbable due to the following circumstances:

(1) Any harm that might occur from sublethal effects is expected to affect only a small portion of the action area (less than 0.2% of any given subbasin); consequently gross errors in the effects analysis are unlikely.

(2) Significant water contamination is not expected to occur, except in isolated cases of short duration (*e.g*. spikes in herbicide concentration following a rainfall, or as a result of a spill), limiting the scope of any take that might occur.

(3) The areas where herbicides would be applied are widely scattered, and with the exception of aerial treatment, the treatment areas generally do not involve large contiguous tracts of land. Consequently, only scattered portions of listed salmon and steelhead populations would be exposed to risks from this action.

(4) Weed treatment areas are most prevalent in dry portions of the action area. The dry areas are typically herbaceous communities that lack a tree canopy, and receive little summer precipitation. There are few streams in these environments that naturally support anadromous fish. Consequently, herbicides that would be used in a large portion of the treatment areas have little or no potential for reaching waters supporting listed fish.

D. Conclusion

After reviewing the current status of the Snake River steelhead and Snake River spring/summer chinook salmon, the environmental baseline for the action area, the effects of the proposed actions, and cumulative effects in the action area, it is NOAA Fisheries' Opinion that the 2003 Noxious Weed Control Program proposed by the BLM CFO is not likely to jeopardize the continued existence of Snake River steelhead and Snake River spring/summer chinook salmon, nor destroy, nor adversely modify critical habitat for spring/summer chinook salmon.

E. Conservation Recommendations

Conservation recommendations are defined as "discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information" (50 CFR 402.02). Section 7 (a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. NOAA Fisheries believes the conservation recommendations listed below are consistent with these obligations, and therefore should be implemented by the CFO.

1. The CFO should use herbicides with the least toxicity to listed fish and other non-target organisms whenever possible.

2. The CFO should continue to investigate the utility of alternative forms of weed control that do not involve the use of chemicals toxic to aquatic organisms.

3. The CFO should evaluate the role of their cattle allotments in propagating noxious weeds, and determine if any PACFISH goals or standards are not being met due to effects of cattle on weed propagation.

NOAA Fisheries recommends that it be notified of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

F. Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; (2) new information reveals effects of the action may affect listed species in a way not previously considered; (3) the action is modified in a way that causes an effect on listed species that was not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending conclusion of the reinitiated consultation.

G. Incidental Take Statement

The ESA at section 9 [16 USC 1538] prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule [50 CFR 223.203]. Take is defined by the statute as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” [16 USC 1532(19)]. Harm is defined by regulation as “an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering” [50 CFR 222.102]. Harass is defined as “an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering" [50 CFR 17.3].

Incidental take is defined as "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" [50 CFR 17.3]. The ESA at section 7(o)(2) removes the prohibition from incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

H. Amount of Extent of Take

The proposed action is reasonably certain to result in incidental take of the listed species. NOAA Fisheries is reasonably certain the incidental take described here will occur because: (1) Recent and historical surveys indicate the listed species are known to occur in the action area; (2) the proposed action would kill or harm individual listed salmon and steelhead through lethal or sub-lethal exposure to herbicides, respectively, as a result of accidental spills, failure of BMPs to keep chemical concentrations below expected levels, unexpected toxic effects that have not been reported in the scientific literature, or additive or synergistic effects of herbicides from multiple sources in the action area; and (3) the proposed action would adversely affect availability of invertebrate prey through toxic effects of herbicides on primary productivity and invertebrate prey.

Despite the use of best scientific and commercial data available, NOAA Fisheries cannot quantify the specific amount of incidental take of individual fish or incubating eggs for this action. The quantity of take depends on the circumstances at the specific locations where treatments will occur (which are not known at this time). In circumstances where the amount of take cannot be quantified, the extent of incidental take is described (50 CFR 402.14 [I]). The extent of take in the action area is anticipated to be no more than 2,241 acres (acreage proposed for treatment), and NOAA Fisheries anticipates that take will not occur in all of the streams within the treatment areas.

I. Reasonable and Prudent Measures

Reasonable and Prudent Measures are non-discretionary measures to minimize take, that may or may not already be part of the description of the proposed action. They must be implemented as binding conditions for the exemption in section 7(a)(2) to apply. The CFO has the continuing duty to regulate the activities covered in this incidental take statement. If the CFO fails to require the applicants to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. NOAA Fisheries believes that activities carried out in a manner consistent with these reasonable and prudent measures, except those otherwise identified, will not necessitate further site-specific consultation. Activities that do not comply with all relevant reasonable and prudent measures will require further consultation.

NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of listed fish resulting from implementation of the action. These reasonable and prudent measures would also minimize adverse effects on designated critical habitat.

1. The CFO shall minimize the amount and extent of incidental take from use of herbicides by implementing precautionary measures that keep chemicals out of water.

2. The CFO shall monitor and report on the effectiveness of the proposed conservation measures in minimizing incidental take, and report this information to NOAA Fisheries.

3. The CFO shall report to NOAA Fisheries the activities actually completed during the 2003 season.

J. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, BLM must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. To Implement Reasonable and Prudent Measure #1, the BLM shall:

    a. Implement all BMPs described in the Proposed Action section of this Opinion, and Appendix D of the BA.

    b. Develop a spill contingency plan prior to herbicide applications. All individuals involved, including any contracted applicators, will be instructed on the spill contingency plan and spill control, containment, and cleanup procedures.

    c. Maintain and have an industry approved spill cleanup kit available whenever herbicides are transported or stored.

d. Ensure all chemical storage, chemical mixing, and post-application equipment cleaning is completed in such a manner as to prevent the potential contamination of any riparian area, perennial or intermittent waterway, unprotected ephemeral waterway, or wetland.

e. Have a licensed/certified herbicide applicator oversee and supervise appropriately trained personnel for all spray projects to ensure proper mixing and application of chemicals.

f. Avoid helicopter (aerial) spraying of low and moderate aquatic risk herbicides (identified in the BA) within 200 feet from the outer boundary of riparian areas for fish bearing streams and lakes, or within 150 feet from the outer boundary of riparian areas for non-fish bearing perennial streams, or within 100 feet of the outer boundary of riparian areas for intermittent streams, springs, seeps, wetlands, ponds, and shallow water table areas.

g. Use only ground-based spot/selective applications of herbicides rated as having a low or moderate level of concern for aquatic species from 15 to 100 feet from live waters or within riparian areas (whichever is greater). No boom spraying is authorized in this zone; only single nozzle spraying equipment is authorized.

h. Use only selective spot spraying of aquatic-approved herbicides, using only backpack spraying, hand-pump spraying, wicking, wiping, painting, dipping, or injecting target species within 15 feet of live water or areas over shallow water tables.

I. Delay treatment if precipitation is likely to occur within 24 hours of scheduled application.

j. Treat only the minimum area necessary for the control of noxious weeds.

k. Prohibit helicopter service landings or fuel storage within 200 feet of fish-bearing streams and lakes, 150 feet of other perennial streams, or 100 feet of intermittent streams, springs, seeps, wetlands, or ponds.

l. Design aerial applications to deliver a median droplet diameter of 200 to 800 microns to reduce drift.

2. To implement Reasonable and Prudent Measure #2, the BLM shall:

   a. Implement a monitoring strategy that includes:

      (1) Drift monitoring with use of spray cards on a representative sample of streams.

(2) Monitoring of non-target plant mortality in riparian areas to determine if mortality of non-target plants is affecting riparian functions in NOAA Fisheries' matrix (NMFS 1996).

b. Report monitoring results to NOAA Fisheries by March 15, 2004.

3. To implement Reasonable and Prudent Measure #3, the BLM shall:

a. Report to NOAA Fisheries the actual number of acres treated, the chemicals used, application method, and location of treatment sites by March 15, 2004. Use a format similar to Table B-1 in the BA.

III. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

A. Background

Pursuant to the MSA:

- NOAA Fisheries must provide conservation recommendations for any Federal or State action that would adversely affect EFH (§305(b)(4)(A));

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

The EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

The EFH consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects on EFH.

B. Identification of EFH

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*)(PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Chief Joseph Dam, Dworshak Dam, and the Hells Canyon Complex (Hells Canyon, Oxbow, and Brownlee Dams) are among the listed man-made barriers that represent the upstream extent of the Pacific salmon fishery EFH. Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

C. Proposed Action

The proposed action and action area are detailed above in Sections I.B. and II.A.1.a. of this document. The entire action area is designated as EFH for chinook salmon, and the Clearwater and Lower Snake River HUCs are designated as EFH for coho salmon.

D. Effects of the Proposed Action

As described in detail in section 3.3, the proposed activities may result in detrimental effects on water quality (chemical contamination). Herbicide concentrations are expected on occasion to reach concentrations where salmon would be harmed by exposure to toxic chemicals, or through effects of toxic chemicals on salmonid prey species.

E. Conclusion

NOAA Fisheries believes that the proposed action may adversely affect EFH for Pacific salmon.

F. EFH Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions that would adversely affect EFH. NOAA Fisheries understands that the conservation measures described in the BA will be implemented by the BLM, but believes these measures are not sufficient to minimize, to the maximum extent practicable, water contamination from herbicides. Although, these conservation measures are not sufficient to fully address effects of water contamination on EFH,
the Terms and Conditions outlined in Section II.B.3. are applicable to designated EFH for chinook and coho salmon, and fully address these adverse effects. Consequently, NOAA Fisheries recommends that they be implemented as EFH conservation measures.

G. Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR 600.920(j), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

H. Supplemental Consultation

The CFO must reinitiate EFH consultation with NOAA Fisheries if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations
(50 CFR 600.920(k)).

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ATTACHMENT A
May 20, 2003

BIOLOGICAL REQUIREMENTS, CURRENT STATUS, AND TRENDS:

SNAKE RIVER STEELHEAD

A. General Life History

Steelhead can be divided into two basic run-types based on the state of sexual maturity at the time of river entry and the duration of the spawning migration (Burgner et al. 1992). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in freshwater to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns shortly after river entry (Barnhart 1986). Variations in migration timing exist between populations. Some river basins have both summer and winter steelhead, while others only have one run-type.

In the Pacific Northwest, summer steelhead enter fresh water between May and October (Busby et al. 1996; Nickelson et al. 1992). During summer and fall, prior to spawning, they hold in cool, deep pools (Nickelson et al. 1992). They migrate inland toward spawning areas, overwinter in the larger rivers, resume migration in early spring to natal streams, and then spawn (Meehan and Bjornn 1991; Nickelson et al. 1992). Winter steelhead enter fresh water between November and April (Busby et al. 1996; Nickelson et al. 1992), migrate to spawning areas, and then spawn in late winter or spring. Some adults, however, do not enter coastal streams until spring, just before spawning (Meehan and Bjornn 1991). Difficult field conditions (snowmelt and high stream flows) and the remoteness of spawning grounds contribute to the relative lack of specific information on steelhead spawning.

Steelhead are iteroparous, or capable of spawning more than once before death. However, it is rare for steelhead to spawn more than twice before dying and most that do so are females (Nickelson et al. 1992). Iteroparity is more common among southern steelhead populations than northern populations (Busby et al. 1996). Multiple spawnings for steelhead range from 3 to 20% of runs in Oregon coastal streams.

Steelhead spawn in cool, clear streams containing suitable gravel size, depth, and current velocity. Intermittent streams may also be used for spawning (Barnhart 1986; Everest 1973). Steelhead enter streams and arrive at spawning grounds weeks or even months before they spawn and are vulnerable to disturbance and predation. Cover in the form of overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water, turbulence, and turbidity (Giger 1973) are required to reduce disturbance and predation of spawning steelhead. Summer steelhead usually spawn further upstream than winter steelhead (Withler 1966; Behnke 1992).

Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months (August 9, 1996, 61 FR 41542) before hatching. Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood. Some older juveniles move downstream to rear in larger tributaries and mainstem rivers (Nickelson et al. 1992).

Juveniles rear in fresh water from 1 to 4 years, then migrate to the ocean as smolts. Winter steelhead populations generally smolt after 2 years in fresh water (Busby et al. 1996). Steelhead typically reside in marine waters for 2 or 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age. Populations in Oregon and California have higher frequencies of age-1-ocean steelhead than populations to the north, but age-2-ocean steelhead generally remain dominant (Busby et al. 1996). Age structure appears to be similar to other west coast steelhead, dominated by 4-year-old spawners (Busby et al. 1996).

Based on purse seine catches, juvenile steelhead tend to migrate directly offshore during their first summer rather than migrating along the coastal belt as do salmon. During fall and winter, juveniles move southward and eastward (Hartt and Dell 1986).

B. Population Dynamics and Distribution

The following section provides specific information on the distribution and population structure (size, variability, and trends of the stocks or populations) of the Snake River evolutionary significant unit (ESU). Most of this information comes from observations made in terminal, freshwater areas, which may be distinct from the action area. This focus is appropriate because the species status and distribution can only be measured at this level of detail as adults return to spawn.

The longest consistent indicator of steelhead abundance in the Snake River Basin is based on counts of natural-origin steelhead at the uppermost dam on the lower Snake River (Lower Granite Dam). The abundance of natural-origin summer steelhead at the uppermost dam on the Snake River has declined from a 4-year average of 58,300 in 1964 to an average of 8,300 ending in 1998. In general, steelhead abundance declined sharply in the early 1970s, rebuilt modestly from the mid-1970s through the 1980s, and again declined during the 1990s (Figure 1).

These broad scale trends in the abundance of steelhead were reviewed through the Plan for analyzing and testing hypotheses (PATH) process. The PATH report concluded that the initial, substantial decline coincided with the declining trend in downstream passage survival. However, the more recent decline in abundance, observed over the last decade or more, does not coincide with declining passage survival, but can be at least partially accounted for by a shift in climatic regimes that has affected ocean survival (Marmorek and Peters 1998).

B-run steelhead are distinguished from the A-run component by their unique life history characteristics. B-run steelhead were traditionally distinguished as larger and older, later-timed fish that return primarily to the South Fork Salmon, Middle Fork Salmon, Selway, and Lochsa rivers. The recent All Species Review by the Technical Advisory Committee (TAC) concluded that different populations of steelhead do have different size structures, with populations dominated by larger fish (i.e., greater than 77.5 cm) occurring in the traditionally defined B-run basins (TAC 1999). Larger fish occur in other populations throughout the basin, but at much lower rates (evidence suggests that fish returning to the Middle Fork Salmon and Little Salmon are intermediate in that they have a more equal distribution of large and small fish).

B-run steelhead are also generally older. A-run steelhead are predominately age-1-ocean fish, whereas most B-run steelhead generally spend two or more years in the ocean prior to spawning. The differences in ocean age are primarily responsible for the differences in the size of A-run and B-run steelhead. However, B-run steelhead are also thought to be larger at the same age than A-run fish. This may be due, in part, to the fact that B-run steelhead leave the ocean later in the year than A-run steelhead and thus have an extra month or more of ocean residence at a time when growth rates are thought to be greatest.

Historically, a distinctly bimodal pattern of freshwater entry could be used to distinguish A-run and B-run fish. A-run steelhead were presumed to cross Bonneville Dam from June to late August whereas B-run steelhead enter from late August to October. The TAC reviewed the available information on timing and confirmed that the majority of large fish do still have a later timing at Bonneville; 70% of the larger fish crossed the dam after August 26, the traditional cutoff date for separating A-run and B-run fish (TAC 1999). However, the timing of the early part of the A-run has shifted somewhat later, thereby reducing the timing separation that was so apparent in the 1960s and 1970s. The timing of the larger, natural-origin B-run fish has not changed.

The abundance of A-run versus B-run components of Snake River Basin steelhead can be distinguished in data collected since 1985. Both components have declined through the 1990s, but the decline of B-run steelhead has been more significant. The 4-year average counts at Lower Granite Dam declined from 18,700 to 7,400 beginning in 1985 for A-run steelhead and from 5,100 to 900 for B-run steelhead. Counts over the last 5 or 6 years have been stable for A-run steelhead and without significant trend (Figure 2). Counts for B-run steelhead have been low and highly variable, but also without apparent trend (Figure 3).

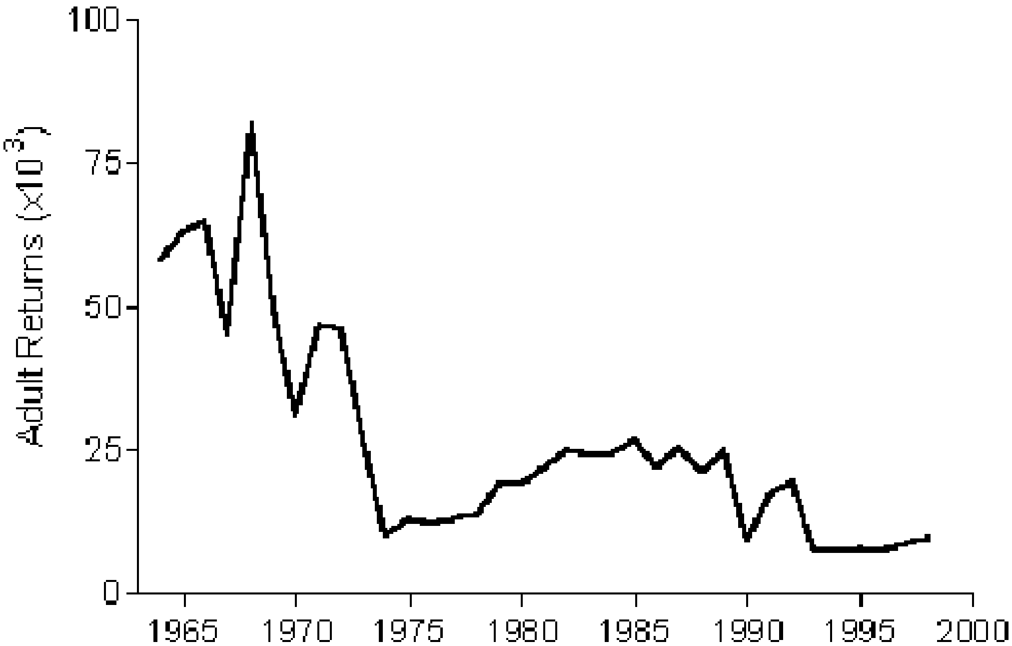
Comparison of recent dam counts with escapement objectives provides perspective regarding the status of the ESU. The management objective for Snake River steelhead stated in the Columbia River Fisheries Management Plan was to return 30,000 natural/wild steelhead to Lower Granite Dam. The All Species Review (TAC 1997) further clarified that this objective was subdivided into 20,000 A-run and 10,000 B-run steelhead. Idaho has reevaluated these escapement objectives using estimates of juvenile production capacity. This alternative methodology lead to revised estimates of 22,000 for A-run and 31,400 for B-run steelhead (pers. comm., S. Keifer, Idaho Department of Fish and Game with P. Dygert, NOAA National Marine Fisheries Service).

The State of Idaho has conducted redd count surveys in all of the major subbasins since 1990. Although the surveys are not intended to quantify adult escapement, they can be used as indicators of relative trends. The sum of redd counts in natural-origin B-run production subbasins declined from 467 in 1990 to 59 in 1998 (Figure 4). The declines are evident in all four of the primary B-run production areas. Index counts in the natural-origin A-run production areas have not been conducted with enough consistency to permit similar characterization.

Idaho has also conducted surveys for juvenile abundance in index areas throughout the Snake River Basin since 1985. Parr densities of A-run steelhead have declined from an average of about 75% of carrying capacity in 1985 to an average of about 35% in recent years through 1995 (Figure 5). Further declines were observed in 1996 and 1997. Parr densities of B-run steelhead have been low, but relatively stable since 1985, averaging 10% to 15% of carrying capacity through 1995. Parr densities in B-run tributaries declined further in 1996 and 1997 to 11% and 8%, respectively.

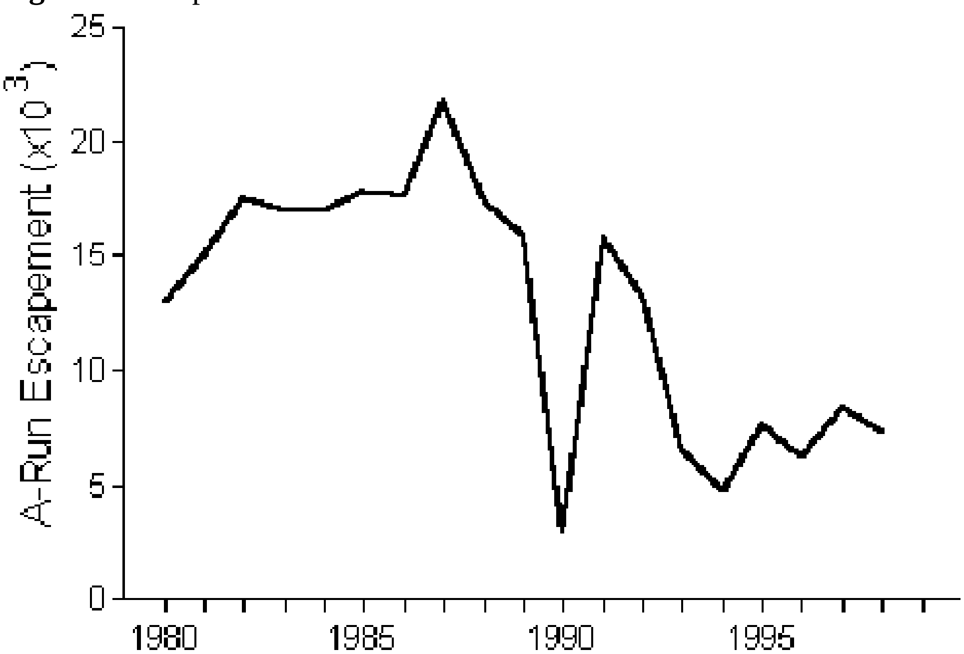
It is apparent from the available data that B-run steelhead are much more depressed than the A-run component. In evaluating the status of the Snake River Basin steelhead ESU, it is pertinent to consider if B-run steelhead represent a "significant portion" of the ESU. This is particularly relevant because the Tribes have proposed to manage the Snake River Basin steelhead ESU as a whole without distinguishing between components, and further, that it is inconsistent with NOAA’s National Marine Fisheries Service (NOAA Fisheries) authority to manage for components of an ESU.

Figure 1. Adult Returns of Wild Summer Steelhead to Lower Granite Dam on the Snake River.



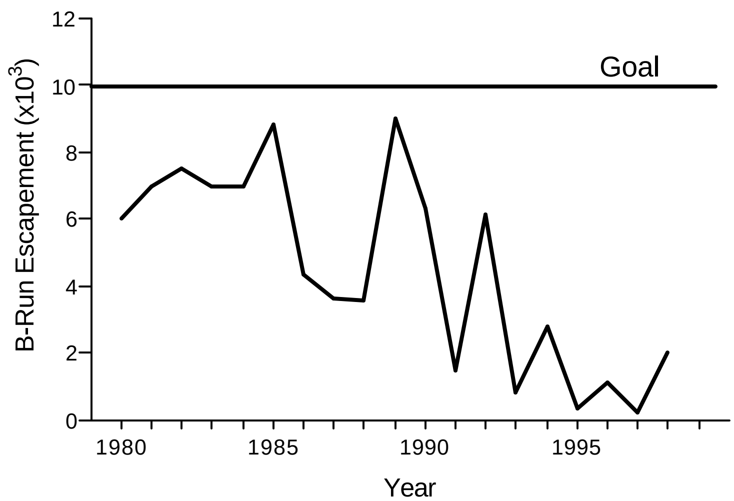
Source: Escapement through 1995 from TAC (1997); escapement for 1996–1998 from pers. comm. G. Mauser (IDFG).

Figure 2. Escapement of A-Run Snake River Steelhead to Lower Granite Dam.



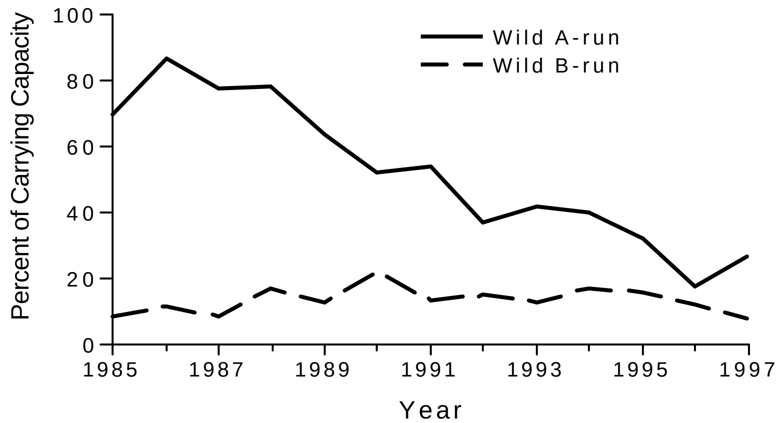
Source: Data for 1980 through 1984 from Figures 1 and 2 of Section 8 in TAC (1997). Data for 1985 through 1998 from Table 2 of Section 8 (TAC 1997) and pers. comm . G. Mauser, (IDFG).

Figure 3. Escapement of B-Run Snake River Steelhead to Lower Granite Dam.



Source: Data for 1980 through 1984 from Figures 1 and 2 of Section 8 in TAC (1997). Data for 1985 through 1998 from Table 2 of Section 8
(TAC 1997) and pers. comm. G. Mauser (IDFG).

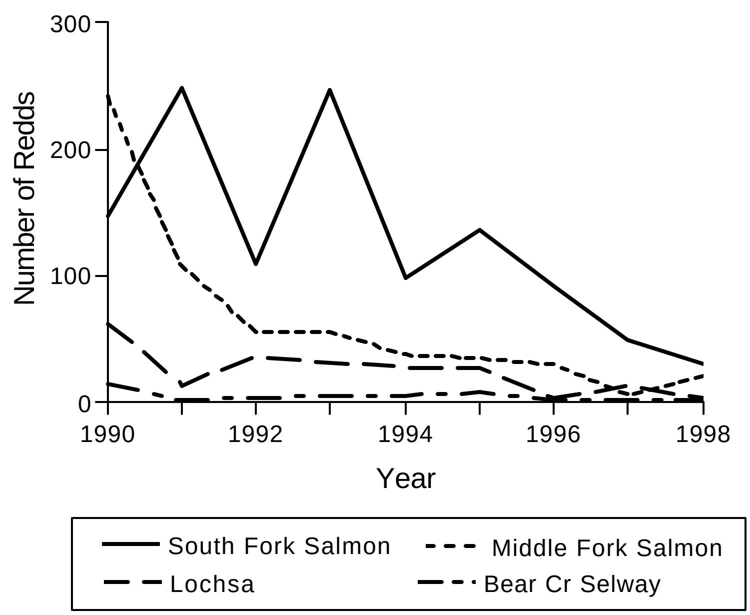
Figure 4. Redd Counts for Wild Snake River (B-Run) Steelhead in the South Fork and Middle Fork Salmon, Lochsa, and Bear Creek-Selway Index Areas.



Data for the Lochsa exclude Fish Creek and Crooked Fork.

Sources: memo from T. Holubetz (IDFG), "1997 Steelhead Redd Counts", dated May 16, 1997, and IDFG (unpublished).

Figure 5. Estimated Carrying Capacity for Juvenile (Age-1+ and -2+) Wild-A and B-Run Steelhead in Idaho Streams



Source: Data for 1985 through 1996 from (Hall-Griswold and Petrosky 1998); data for 1997 from IDFG (unpublished).

It is first relevant to put the Snake River basin into context. The Snake River historically supported over 55% of total natural-origin production of steelhead in the Columbia River Basin and now has approximately 63% of the basin's natural production potential (Mealy 1997). B-run steelhead occupy four major subbasins including two on the Clearwater River (Lochsa and Selway) and two on the Salmon River (Middle Fork and South Fork Salmon), areas that for the most part are not occupied by A-run steelhead. Some natural B-run steelhead are also produced in parts of the mainstem Clearwater and its major tributaries. There are alternative escapement objectives for B-run steelhead of 10,000 (TAC 1997) and 31,400 (Idaho). B-run steelhead, therefore, represent at least 1/3 and as much as 3/5 of the production capacity of the ESU.

As pointed out above, the geographic distribution of B-run steelhead is restricted to particular watersheds within the Snake River Basin (areas of the mainstem Clearwater, Selway, and Lochsa Rivers and the South and Middle Forks of the Salmon River). No recent genetic data are available for steelhead populations in South and Middle Forks of the Salmon River. The Dworshak National Fish Hatchery (NFH) stock and natural populations in the Selway and Lochsa Rivers are thus far the most genetically distinct populations of steelhead in the Snake River Basin (Waples et al. 1993). In addition, the Selway and Lochsa River populations from the Middle Fork Clearwater appear to be very similar to each other genetically, and naturally produced rainbow trout from the North Fork Clearwater River (above Dworshak Reservoir) clearly show an ancestral genetic similarity to Dworshak NFH steelhead. The existing genetic data, the restricted geographic distribution of B-run steelhead in the Snake (Columbia) River Basin, and the unique life history attributes of these fish (i.e. larger, older adults with a later distribution of run timing compared to A-run steelhead in other portions of the Columbia River Basin) clearly support the conservation of B-run steelhead as a biologically significant component of the Snake River ESU.

Another approach to assessing the status of an ESU being developed by NOAA Fisheries is to consider the status of its component populations. For this purpose a population is defined as a group of fish of the same species spawning in a particular lake or stream (or portion thereof) at a particular season, which to a substantial degree do not interbreed with fish from any other group spawning in a different place or in a the same place at a different season. Because populations as defined here are relatively isolated, it is biologically meaningful to evaluate the risk of extinction of one population independently from any other. Some ESUs may be comprised of only one population whereas others will be constituted by many. The background and guidelines related to the assessment of the status of populations is described in a recent draft report discussing the concept of viable salmonid populations (McElhany et al. 2000).

The task of identifying populations within an ESU will require making judgements based on the available information. Information regarding the geography, ecology, and genetics of the ESU are relevant to this determination. Although NOAA Fisheries has not compiled and formally reviewed all the available information for this purpose, it is reasonable to conclude that, at a minimum, each of the major subbasins in the ESU represent a population within the context of this discussion. A-run populations would therefore include at least the tributaries to the lower Clearwater, the upper Salmon River and its tributaries, the lower Salmon River and its tributaries, the Grand Ronde, Imnaha, and possibly the Snake River mainstem tributaries below Hells Canyon Dam. B-run populations would be identified in the Middle Fork and South Fork Salmon Rivers and the Lochsa and Selway Rivers (major tributaries of the upper Clearwater), and possibly in the mainstem Clearwater River, as well. These basins are, for the most part, large geographical areas and it is quite possible that there is additional population structure within at least some of these basins. However, because that hypothesis has not been confirmed, NOAA Fisheries assumes that there are at least five populations of A-run steelhead and five populations of B-run steelhead in the Snake River basin ESU. Escapement objectives for A and B-run production areas in Idaho, based on estimates of smolt production capacity, are shown in Table 1.

Table 1. Adult Steelhead Escapement Objectives Based on Estimates of 70% Smolt Production Capacity

A-Run Production Areas		**B-Run Production Areas**	
Upper Salmon	13,570	Middle Fork Salmon	9,800
Lower Salmon	6,300	South Fork Salmon	5,100
Clearwater	2,100	Lochsa	5,000
Grand Ronde	(1)	Selway	7,500
Imnaha	(1)	Clearwater	4,000
Total	**21,970**	**Total**	**31,400**

Note: comparable estimates are not available for populations in Oregon and Washington subbasins.

<u>1. Lower Snake River Subbasin</u>

Information on steelhead distribution, important watersheds, and conditions and trends in the Lower Snake River is summarized from the Lower Snake River Subbasin Biological Assessment (Bureau of Land Management [BLM] 2000a), except where noted.

a. Species Distribution:

Within the Lower Snake River Subbasin steelhead use occurs in most of the accessible streams when stream conditions are suitable. Steelhead use the mainstem Snake River for upstream and downstream passage. A limited amount of juvenile rearing and overwintering by adults occurs in the Snake River. Most accessible tributaries are used by steelhead for spawning and rearing. The larger streams used for spawning and rearing include Asotin, Ten Mile, Couse, Captain John, Jim, and Cook Creeks. Other smaller tributary streams with limited rainbow/steelhead use include Tammany, Tenmile, Corral, Cache, Cottonwood, and Cherry Creeks.

b. Location of Important Spawning and Rearing Areas:

Asotin Creek, followed by Captain John, Ten Mile, and Couse Creeks have the highest potential for steelhead production within the subbasin. Priority watersheds include Asotin and Captain John Creeks.

c. Conditions and Trends of Populations:

Despite their relatively broad distribution, very few healthy steelhead populations exist (Quigley and Arbelbide 1997). Recent status evaluations suggest many steelhead stocks are depressed. A recent multi-agency review showed that total escapement of salmon and steelhead to the various Columbia River regions has been in decline since 1986 (Anderson et al. 1996). Existing steelhead stocks consist of four main types: wild, natural (non-indigenous progeny spawning naturally), hatchery, and mixes of natural and hatchery fish. Production of wild anadromous fish in the Columbia River Basin has declined about 95% from historical levels (Huntington et al. 1994). Most existing steelhead production is supported by hatchery and natural fish as a result of large-scale hatchery mitigation production programs. Wild, indigenous fish, unaltered by hatchery stocks, are rare and present in only 10% of the historical range and 25% of the existing range. Remaining wild stocks are concentrated in the Salmon and Selway (Clearwater Basin) rivers in central Idaho and the John Day River in Oregon. Although few wild stocks were classified as strong, the only subwatersheds classified as strong were those sustaining wild stocks.

<u>2. Clearwater River, North Fork Clearwater River, and Middle Fork Clearwater River Subbasins</u>

Information on steelhead distribution, important watersheds, and conditions and trends in the Clearwater River is summarized from the Clearwater River, North Fork Clearwater River and Middle Fork Clearwater River Subbasins Biological Assessment (BA) (BLM 2000b), except where noted.

a. Species Distribution:

Within the Clearwater River Subbasin steelhead use is widespread and most accessible tributaries are used year-long or seasonally. In the Clearwater River drainage, the primary steelhead producing streams include: Potlatch River; Lapwai, Big Canyon, Little Canyon, Lolo, and Lawyer Creeks. Other Clearwater River mainstem tributary streams providing spawning and/or rearing habitat for steelhead include Lindsay, Hatwai, Lapwai, Catholic, Cottonwood, Pine, Bedrock, Jacks, Big Canyon, Orofino, Jim Ford, Big, Fivemile, Sixmile, and Tom Taha Creeks. Some of these streams provide sub-optimal spawning and rearing habitat because of steep stream gradients, barriers, low flows, limited spawning gravels, and small size of tributaries.

In the 1969 the United States Army Corps of Engineers finished construction of Dworshak Dam on the North Fork Clearwater River, which totally blocked access to anadromous fish. To mitigate for the steelhead losses resulting from the dam, Dworshak NFH was constructed in 1969. Wild B-run steelhead are collected at the base of the dam and used as the brood stock for Dworshak NFH. Since 1992, steelhead eggs collected at Dworshak NFH have been shipped as eyed eggs to the Clearwater Fish Hatchery, located at the confluence of the North Fork Clearwater River and the Clearwater River, for incubation and rearing. Three satellite facilities are associated with the Clearwater Fish Hatchery: Crooked River, Red River, and Powell. The Kooskia NFH is located on Clear Creek, a tributary to the Middle Fork Clearwater River.

b. Location of Important Spawning and Rearing Areas:

The only watershed identified as a special emphasis or priority watershed for steelhead in the Clearwater River Subbasin is Lolo Creek.

c. Conditions and Trends of Populations:

Refer to "Conditions and Trends of Populations" under Lower Snake River Subbasin above.

<u>3. South Fork Clearwater River Subbasin</u>

Information on steelhead distribution, important watersheds, and conditions and trends in the South Fork Clearwater River is summarized from the Draft Clearwater Subbasin Assessment (CPAG 2001), except where noted.

a. Species Distribution:

Within the South Fork Clearwater River Subbasin, steelhead use is widespread, and most accessible tributaries are used year-long or seasonally. In the South Fork drainage, the primary steelhead producing drainages include Newsome Creek, American River, Red River, and Crooked River. Other South Fork Clearwater River mainstem tributary streams providing spawning and/or rearing habitat for steelhead include Tenmile, Johns, Meadow, and Mill Creeks (Jody Brostrom, Idaho Department of Fish and Game, pers. comm. March 30, 2001). Low order streams and accessible headwater portions of high order streams provide early rearing habitat (Nez Perce National Forest 1998).

b. Location of Important Spawning and Rearing Areas:

Important spawning habitat in the South Fork Clearwater occurs primarily in Newsome Creek, American River, Red River, and Crooked River.

c. Conditions and Trends of Populations:

The South Fork Clearwater River may have historically maintained a genetically unique stock of steelhead, but hatchery supplementation has since clouded the lines of genetic distinction between stocks (Nez Perce National Forest 1998). Robin Waples (In a letter to S. Kiefer, Idaho Department of Fish and Game, August 25, 1998) found that steelhead in Johns and Tenmile Creeks are genetically most similar to fish originating from the Selway River system, suggesting that some genetic difference may have existed historically within the South Fork Clearwater drainage. A statewide genetic analysis is currently being conducted using DNA markers, and may provide more information on past and current genetic distinctions between steelhead stocks in the Clearwater subbasin (Byrne 2001).

4. Selway River Subbasin

Information on steelhead distribution, important watersheds, and conditions and trends in the Selway River is summarized from the Lower Selway Biological Assessment (USFS 1999a), the Biological Opinion on Culvert Replacements on Lolo Creek and Lochsa River [National Marine Fisheries Service (NMFS) 2002a], and the Biological Opinion on Recreational Suction Dredge Mining in Lolo Creek (NOAA Fisheries 2003), except where noted.

a. Species Distribution:

High numbers of juvenile steelhead have been documented in all of the fifth code watersheds above the Selway-Bitterroot wilderness boundary. In addition, Meadow and Gedney Creeks also support high numbers of both steelhead and resident rainbow trout. Densities of steelhead are less in O'hara, Swiftwater, Goddard, and Falls Creeks (USFS unpublished data 1990 - 1998). Densities in Nineteenmile, Rackliffe, Boyd, and Glover Creeks are limited by small size and accessibility although the species is present. Spawning habitat for steelhead has been documented in most of the surveyed tributaries, including small third order streams such as Renshaw and Pinchot Creeks. In the Selway River, stream survey data and casual observations suggest that the steelhead/rainbow population in the larger tributaries, i.e. Meadow and Moose Creeks, are composed of a significant resident rainbow/redband component (USFS unpublished data 1996, 1997). Survey data and observations revealed the presence of large number of rainbow trout greater than 220 mm, especially in North Moose Creek. In addition, observations suggest the presence of two distinct forms of this species. Steelhead and rainbow of all sizes differed phenotypically; there appeared to be a distinct "steelhead" presmolt form, which was more bullet-shaped and silvery in color, and a distinct "trout" form, which was less bullet-shaped, retained parr marks at larger sizes, and exhibited coloration and spotting more typical of other inland rainbow populations. It is possible that resident rainbow trout and steelhead are reproductively isolated, which may have resulted in genetic divergence. Analysis of the genetic composition of the Moose Creek population may be attempted in future years.

b. Location of Important Spawning and Rearing Areas:

The most important spawning and rearing areas for steelhead are located in the larger tributaries, such as Meadow, Moose, Gedney, Three Links, Marten, Bear, Whitecap, Running, Ditch, Deep, and Wilkerson Creeks. Moose Creek may support the most significant spawning and rearing habitat for steelhead of any of these tributaries.

c. Conditions and Trends of Populations:

The Selway River drainage (along with the Lochsa and lower Clearwater River tributary systems) is one of the only drainages in the Clearwater Subbasin where steelhead populations have little or no hatchery influence (Busby et al. 1996; IDFG 2001). The USFS (1999a) identified the Lochsa and Selway River systems as refugia areas for steelhead based on location, accessibility, habitat quality, and number of roadless tributaries. The Idaho Department of Fish and Game (IDFG) estimates that approximately 80% of the wild steelhead in the Clearwater River Subbasin are destined for the Lochsa River and Selway River drainages. The Clearwater River Basin produces the majority of B-run steelhead in the Snake River ESU, and most of the Clearwater steelhead are produced in the Lochsa River Subbasin. The Lochsa River Subbasin has the highest observed densities of age 1+ B-run steelhead parr, and the highest percent carrying capacity (IDFG 1999). Hatchery steelhead were used to supplement natural populations in the Lochsa River drainage before 1982, but current management does not include any hatchery supplementation. Current adult returns are considered to be almost entirely wild steelhead progeny.

5. Lochsa River Subbasin

Information on steelhead distribution, important watersheds, and conditions and trends in the Lochsa River is summarized from the Biological Opinion on Culvert Replacements on Lolo Creek and Lochsa River (NMFS Fisheries 2002a) and the Biological Opinion on Recreational Suction Dredge Mining in Lolo Creek (NOAA Fisheries 2003), except where noted.

a. Species Distribution:

Adult Snake River steelhead are present in the upper mainstem Clearwater River in September and October, and in the upper mainstem and Middle Fork Clearwater Rivers in the winter. Spawning and incubation occurs in streams such as the Lochsa River from March through July. Steelhead juveniles then typically rear for 2 to 3 years in the tributaries and larger rivers before beginning a seaward migration during February through May.

b. Location of Important Spawning and Rearing Areas:

Steelhead have been observed in most of the larger tributaries to the Lochsa River, with high steelhead productivity occurring in Fish, Boulder, Deadman, Pete King, and Hungry Creeks (USFS 1999b).

c. Conditions and Trends of Populations:

Refer to "Conditions and Trend of Populations" under Selway River Subbasin above.

6. Lower Salmon River Subbasin

Information on steelhead distribution, important watersheds, and conditions and trends in the Lower Salmon River is summarized from the Lower Salmon River Subbasin Biological Assessment (BLM 2000c).

a. Species Distribution:

Within the Lower Salmon River Subbasin, steelhead use occurs in most of the accessible streams when stream conditions are suitable. Steelhead use the mainstem Salmon River for upstream and downstream passage. A limited amount of juvenile rearing and adult overwintering may occur in the Salmon River. Most accessible tributaries are used by steelhead for spawning and rearing. The larger streams used for spawning and rearing include China, Eagle, Deer, Cottonwood, Maloney, Deep, Rice, Rock, White Bird, Skookumchuck, Slate, John Day, Race, Lake, Allison, Partridge, Elkhorn, and French Creeks. Other smaller tributary streams with limited rainbow/steelhead use include Flynn, Wapshilla, Billy, Burnt, Round Springs, Telcher, Deer, McKinzie, Christie, Sherwin, China, Cow, Fiddle, Warm Springs, Van, and Robbins Creeks.

b. Location of Important Spawning and Rearing Areas:

Slate Creek, followed by White Bird Creek, has the highest potential for steelhead production within the subbasin. Priority watersheds identified for steelhead include China, Eagle, Deer, White Bird, Skookumchuck, Slate, John Day, Race, Allison, Partridge, and French Creeks. Other streams which are important for spawning and rearing include Cottonwood, Maloney, Deep, Rice, Rock, Lake, and Elkhorn Creeks.

c. Conditions and Trends of Populations:

The Bureau of Land Management (BLM) noted that current numbers of naturally spawning steelhead in the Salmon River Subbasin are at all time lows, and overall trend is downward. Adult steelhead were commonly observed in most larger tributaries during the 1970s through 1980s, but now such observations have significantly declined (BLM 2000c).

The Nez Perce National Forest conducted an ecosystem analysis at the watershed scale for Slate Creek (USFS 2000) and concluded that the distribution of fish species assessed is relatively consistent with historic distribution. Steelhead populations are thought to have experienced a great decline from historic levels although the data to describe the extent of this reduction is not available (USFS 2000). The BLM has conducted trend monitoring of fish populations in lower Partridge Creek and French Creek. Partridge Creek densities of age 0 rainbow/steelhead in 1988 were 0.30 fish/m2 and age 1 rainbow/steelhead densities were 0.19 fish/m2. In 1997, age 0 densities were 0.003 fish/m2 and age 1 densities were 0.01 fish/m2. French Creek densities of age 0 rainbow/steelhead in 1991 were 0.07 fish/m2 and age 1 rainbow/steelhead densities were 0.07 fish/m2. In 1997, age 0 densities were 0.0075 fish/m2 and age 1 densities were 0.02 fish/m2. Densities of steelhead have significantly declined from the 1980s through the late 1990s.

<u>7. Little Salmon River Subbasin</u>

Information on steelhead distribution, important watersheds, and conditions and trends in the Little Salmon River is summarized from the Little Salmon River Subbasin Biological Assessment (BLM 2000d), except where noted.

a. Species Distribution:

Within the Little Salmon River Subbasin, steelhead use occurs in the lower portion of the subbasin and tributaries, downstream from barriers located at river mile (RM) 21 in the Little Salmon River. No recent or historic documentation exists for steelhead using streams above RM 24 in the Little Salmon

River. Welsh et al. (1965) reports that no known passage by salmon or steelhead exists above the Little Salmon River falls. Ineffectual fish passage facilities were constructed at the falls by the Civilian Conservation Corps during the 1930s (Welsh et al. 1965). Streams and rivers providing important spawning and rearing for steelhead include Little Salmon and River Rapid Rivers, and Boulder, Hazard, and Hard Creeks. Other Little Salmon River mainstem tributary streams providing spawning and rearing habitat include Squaw, Sheep, Hat, Denny, Lockwood, Rattlesnake, Elk, and Trail Creeks. Adult steelhead have been documented in these streams. Primary steelhead use of these streams is often associated with the mouth area or a small stream segment or lower reach, before steep gradients/cascades or a barrier restricts upstream fish passage. These streams generally provide sub-optimal spawning and rearing habitat because of steep stream gradients, barriers, low flows, limited spawning gravels, and small size of tributaries.

b. Location of Important Spawning and Rearing Areas:

Priority watersheds for steelhead include Rapid River, Boulder, Hazard, and Hard Creeks. These streams provide important spawning and rearing habitat for steelhead. Rapid River is a stronghold and key refugia area for steelhead.

c. Conditions and Trends of Populations:

The BLM noted that current numbers of naturally spawning steelhead in the Little Salmon River Subbasin are at all-time lows, and overall trend is downward. The highest number of adult natural spawning steelhead counted at the Rapid River weir was 162 in 1993, and the lowest counted was 10 in 1999 (BLM 2000d).

8. Middle Salmon River Subbasin

Information on steelhead distribution, important watersheds, and conditions and trends in the Middle Salmon River is summarized from the Middle Salmon River and South Fork Salmon River Subbasins Biological Assessment (BLM 2000e), except where noted.

a. Species Distribution:

Within the Middle Salmon River Subbasin, steelhead use the mainstem Salmon River for upstream and downstream passage. A limited amount of juvenile rearing and adult overwintering may occur in the Middle Salmon River. Most accessible tributaries are used by steelhead for spawning and rearing. Key steelhead spawning and rearing is probably occurring in Crooked, Bargamin and Sabe Creeks and the lower Wind River on the north side of the Salmon River and California, Warren, Chamberlain, and Horse Creeks on the south side of the Salmon River.

b. Location of Important Spawning and Rearing Areas:

Priority watersheds for steelhead include Warren and California Creeks. Steelhead use Warren Creek for spawning and rearing habitat. No fish passage barriers exist for steelhead within the drainage. Steelhead were found in Richardson, Stratton, Steamboat, and Slaughter Creeks (Raleigh 1995). Most other tributaries were surveyed, but no steelhead were found. Because of habitat alterations from past mining (e.g., in-channel dredging, piling of dredged material adjacent to streams) and limited suitable habitat, steelhead use of the upper portion of the Warren Creek subwatershed is limited. Carey and Bear Creeks provide habitat in the lower reaches.

c. Conditions and Trend of Populations: Refer to "Conditions and Trends of Populations" under Lower Salmon River Subbasin above.

9. South Fork Salmon River Subbasin

Information on steelhead distribution, important watersheds, and conditions and trends in the South Fork Salmon River is summarized from the Middle Salmon River and South Fork Salmon River Subbasins Biological Assessment (BLM 2000e), except where noted.

a. Species Distribution:

Steelhead have been documented in the South Fork Salmon River and lower portions of its major tributaries. Most of the mainstem spawning occurs between the East Fork Salmon River and Cabin Creek. Principle spawning areas are located near Stolle Meadows, from Knox Bridge to Penny Spring, Poverty Flat, Darling cabins, the Oxbow, and from 22 Hole to Glory Hole (USFS 1998).

b. Location of Important Spawning and Rearing Areas:

Primary spawning tributaries in the South Fork Salmon River Subbasin are Burntlog, Lick, Lake, and Johnson Creeks, the East Fork South Fork Salmon and Secesh Rivers (USFS 1998).

c. Conditions and Trends of Populations:

Refer to "Conditions and Trends of Populations" under Lower Salmon River Subbasin above.

10. Upper Salmon River Subbasin

Information on steelhead distribution, important watersheds, and conditions and trends in the Upper Salmon River is summarized from the Biological Opinion on Effects of 2002 Herbicide Treatment of Noxious Weeds on Lands Administered by the Salmon-Challis National Forest (NMFS 2002b).

a. Species Distribution:

Steelhead in the Upper Salmon River subbasin occur in most of the accessible streams when stream conditions are suitable. Steelhead use the mainstem for upstream and downstream passage. A limited amount of juvenile rearing and adult overwintering occurs in the Upper Salmon River. Most accessible tributaries are used for spawning and rearing.

b. Location of Important Spawning and Rearing Areas:

Key steelhead spawning and rearing probably occurs in Morgan, Thompson and Panther Creeks, in addition to the Yankee Fork Salmon, Pahsimeroi, North Fork Salmon, East Fork Salmon, and Lemhi Rivers.

c. Conditions and Trends of Populations:

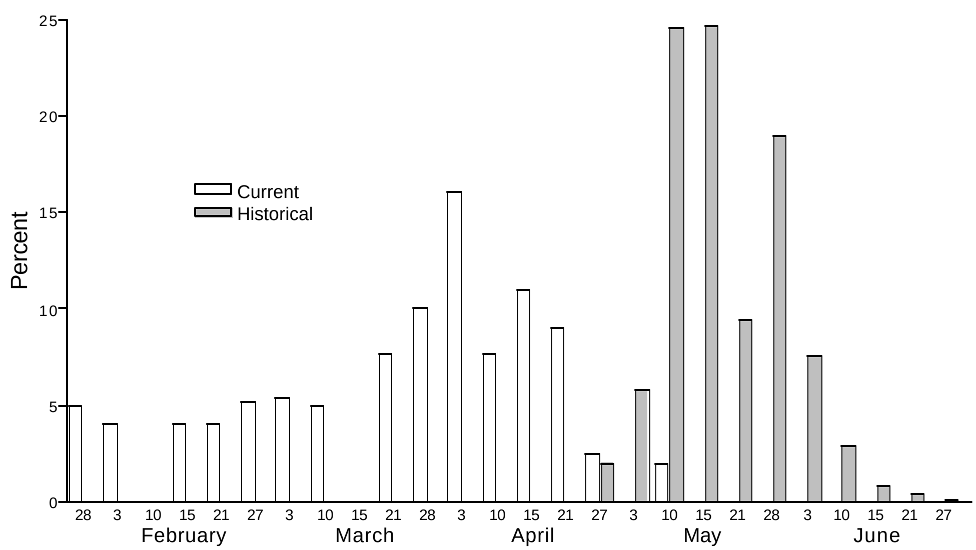
Refer to "Conditions and Trends of Populations" under Lower Salmon River Subbasin above.

C. Hatchery Populations

Hatchery populations, if genetically similar to their natural-origin counterparts, provide a hedge against extinction of the ESU or of the gene pool. The Imnaha and Oxbow hatcheries produce A-run stocks that are currently included in the Snake River basin steelhead ESU. The Pahsimeroi and Wallowa hatchery stocks may also be appropriate and available for use in developing supplementation programs; NOAA Fisheries required in its recent biological opinion on Columbia basin hatchery operations that this program begin to transition to a local-origin broodstock to provide a source for future supplementation efforts in the lower Salmon River (NMFS 1999). Although other stocks provide more immediate opportunities to initiate supplementation programs within some subbasins, it may also be necessary and desirable to develop additional broodstocks that can be used for supplementation in other natural production areas. Despite uncertainties related to the likelihood that supplementation programs can accelerate the recovery of naturally spawning populations, these hatchery stocks provide a safeguard against the further decline of natural-origin populations.

The Dworshak NFH is unique in the Snake River Basin in producing a B-run hatchery stock. The Dworshak stock was developed from natural-origin steelhead from the North Fork Clearwater River, is largely free of other hatchery introductions, and was therefore included in the ESU, although not as part of the listed population. However, past hatchery practices and possibly changes in flow and temperature conditions related to Dworshak Dam have lead to substantial divergence in spawn timing of the hatchery stock compared to historical timing in the North Fork Clearwater River, and compared to natural-origin populations in other parts of the Clearwater Basin. Because the spawn timing of the hatchery stock is much earlier than historically (Figure 6), the success of supplementation efforts using these stocks may be limited. In fact, past supplementation efforts in the South Fork Clearwater River using Dworshak NFH stock have been largely unsuccessful, although improvements in out-planting practices have the potential to yield different results.

Figure 6. Historical Versus Current Spawn-Timing of Steelhead at Dworshak Hatchery.



In addition, the unique genetic character of Dworshak NFH steelhead will limit the degree to which the stock can be used for supplementation in other parts of the Clearwater Subbasin, and particularly in the Salmon River B-run basins. Supplementation efforts in those areas, if undertaken, will more likely have to rely on the future development of local broodstocks. Supplementation opportunities in many of the B-run production areas may be limited because of logistical difficulties associated with high mountain, wilderness areas. Because opportunities to accelerate the recovery of B-run steelhead through supplementation, even if successful, are expected to be limited, it is essential to maximize the escapement of natural-origin steelhead in the near term.

D. Conclusion

Finally, the conclusion and recommendations of the TAC's All Species Review (TAC 1997) are pertinent to this status review of Snake River steelhead. Considering information available through 1996, the 1997 All Species Review stated:

> "Regardless of assessment methods for A and B steelhead, it is apparent that the primary goal of enhancing the upriver summer steelhead run is not being achieved. The status of upriver summer steelhead, particularly natural-origin fish, has become a serious concern. Recent declines in all stocks, across all measures of abundance, are disturbing."
>
> "There has been no progress toward rebuilding upriver runs since 1987. Throughout the Columbia River basin, dam counts, weir counts, spawning surveys, and rearing densities indicate natural-origin steelhead abundance is declining, culminating in the proposed listing of upriver stocks in 1996. Escapements have reached critically low levels despite the relatively high productivity of natural and hatchery rearing environments. Improved flows and ocean conditions should increase smolt-adult survival rates for upriver summer steelhead. However, reduced returns in recent years are likely to produce fewer progeny and lead to continued low abundance."
>
> "Although steelhead escapements would have increased (some years substantially) in the absence of mainstem fisheries, data analyzed by the TAC indicate that effects other than mainstem Columbia River fishery harvest are primarily responsible for the currently depressed status and the long term health and productivity of wild steelhead populations in the Columbia River."
>
> "Though harvest is not the primary cause of declining summer steelhead stocks, and harvest rates have been below guidelines, harvest has further reduced escapements. Prior to 1990, the aggregate of upriver summer steelhead in the mainstem Columbia River appears at times to have led to the failure to achieve escapement goals at Lower Granite Dam. Wild Group B steelhead are presently

> more sensitive to harvest than other salmon stocks, including the rest of the steelhead run, due to their depressed status and because they are caught at higher rates in the Zone 6 fishery."

Small or isolated populations are much more susceptible to stochastic events such as drought and poor ocean conditions. Harvest can further increase the susceptibility of such populations. The Columbia River Fish Management Plan (TAC 1997) recognizes that harvest management must be responsive to run size and escapement needs to protect these populations. The parties should ensure that TAC 1997 harvest guidelines are sufficiently protective of weak stocks and hatchery broodstock requirements.

For the Snake River steelhead ESU as a whole, the median population growth rate (lambda) from years 1980-1997, ranges from 0.699 to 0.978, depending on the assumed number of hatchery fish reproducing in the river (Table 2). NOAA Fisheries estimated the risk of absolute extinction for A- and B-runs, based on assumptions of complete hatchery spawning success, and no hatchery spawning success. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.01 for A-run steelhead and 0.93 for B-run fish. At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of absolute extinction within 100 years is 1.00 for both runs.

Table 2. Annual rate of population change (λ) in Snake River steelhead, absolute risk of extinction (1 fish/generation), and risk of 90% decline in 24 and 100 years for the period 1980-1997†. The range of reported values assumes that hatchery-origin fish either do not contribute to natural production or are as productive as natural-origin spawners.

Model Assumptions	l	**Risk of Extinction**		**Probability of 90% decrease in stock abundance**	
		24 years	100 years	24 years	100 years
No Correction for Hatchery Fish	0.978	A-Run 0.000 B-Run 0.000	A-Run 0.000 B-Run 0.000	A-Run 0.000 B-Run 0.060 Aggregate 0.000	A-Run 0.000 B-Run 0.520 Aggregate 0.434
No Instream Hatchery Reproduction	0.910	A-Run 0.000 B-Run 0.000	A-Run 0.010 B-Run 0.093	A-Run 0.200 B-Run 0.730 Aggregate 0.476	A-Run 1.000 B-Run 1.000 Aggregate 1.000
Instream Hatchery Reproduction = Natural Reproduction	0.699	A-Run 0.000 B-Run 0.000	A-Run 1.000 B-Run 1.000	A-Run 1.000 B-Run 1.000 Aggregate 1.000	A-Run 1.000 B-Run 1.000 Aggregate 1.000

† From Table B-2a and B-2b. Cumulative Risk Initiative. September 5, 2000, revised appendix B (McClure et al. 2000).

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ATTACHMENT B

June 9, 2003

BIOLOGICAL REQUIREMENTS,
CURRENT STATUS,
AND TRENDS:

SNAKE RIVER SPRING/SUMMER CHINOOK SALMON

A. Chinook Salmon Life History

Chinook salmon are the largest of the Pacific salmon. The species' distribution historically ranged from the Ventura River in California to Point Hope, Alaska, in North America, and in northeastern Asia from Hokkaido, Japan, to the Anadyr River in Russia (Healey 1991). Additionally, chinook salmon have been reported in the Mackenzie River area of northern Canada (McPhail and Lindsey 1970). Of the Pacific salmon, chinook salmon exhibit a very diverse and complex life history strategy. Healey (1986), described 16 age categories for chinook salmon, seven total ages with three possible freshwater ages. This level of complexity is roughly comparable to that seen in sockeye salmon (Oncorhynchus nerka), although the latter species has a more extended freshwater residence period and uses different freshwater habitats (Miller and Brannon 1982, Burgner 1991). Two generalized freshwater life-history types were initially described by Gilbert (1912): "stream-type" chinook salmon, which reside in fresh water for a year or more following emergence, and "ocean-type" chinook salmon, which migrate to the ocean within their first year. Healey (1983, 1991) has promoted the use of broader definitions for "ocean-type" and "stream-type" to describe two distinct races of chinook salmon. Healey's approach incorporates life history traits, geographic distribution, and genetic differentiation and provides a valuable frame of reference for comparisons of chinook salmon populations.

The generalized life history of Pacific salmon involves incubation, hatching, and emergence in fresh water; migration to the ocean; and the subsequent initiation of maturation and return to fresh water for completion of maturation and spawning (NMFS 2000). The juvenile rearing period in fresh water can be minimal or extended. Additionally, some male chinook salmon mature in fresh water, thereby foregoing emigration to the ocean. The timing and duration of each of these stages is related to genetic and environmental determinants and their interactions to varying degrees. Although salmon exhibit a high degree of variability in life-history traits, there is considerable debate as to what degree this variability is shaped by local adaptation or results from the general plasticity of the salmonid genome (Ricker 1972, Healey 1991, Taylor 1991). More detailed descriptions of the key features of chinook salmon life history can be found in Myers et al. (1998) and Healey (1991).

B. Population Dynamics, Distribution, Status and Trends

The following sections provide specific information on the distribution and population structure (size, variability, and trends of the stocks or populations) for the listed evolutionary significant unit (ESU). Most of this information comes from observations made in terminal, freshwater areas, which may be distinct from the action area. This focus is appropriate because the species status and distribution can only be measured at this level of detail as adults return to spawn.

1. Snake River Spring/Summer Chinook Salmon

The present range of spawning and rearing habitat for naturally-spawned Snake River spring/summer chinook salmon is primarily limited to the Salmon, Grande Ronde, Imnaha, and Tucannon Subbasins. Most Snake River spring/summer chinook salmon enter individual subbasins from May through September. Juvenile Snake River spring/summer chinook salmon emerge from spawning gravels from February through June (Perry and Bjornn 1991). Typically, after rearing in their nursery streams for about 1 year, smolts begin migrating seaward in April and May (Bugert et al. 1990; Cannamela 1992). After reaching the mouth of the Columbia River, spring/summer chinook salmon probably inhabit near shore areas before beginning their northeast Pacific Ocean migration, which lasts two to three years. Because of their timing and ocean distribution, these stocks are subject to very little ocean harvest. For detailed information on the life history and stock status of Snake River spring/summer chinook salmon, see Matthews and Waples (1991), NMFS (1991), and 56 FR 29542 (June 27, 1991).

Bevan et al. (1994) estimated the number of wild adult Snake River spring/summer chinook salmon in the late 1800s to be more than 1.5 million fish annually. By the 1950s, the population had declined to an estimated 125,000 adults. Escapement estimates indicate that the population continued to decline through the 1970s. Returns were variable through the 1980s, but declined further in recent years. Record low returns were observed in 1994 and 1995. Fish counts at the mainstem dams were modestly higher from 1996 through 1998, declined in 1999, but increased again in 2000. For management purposes, the spring and summer chinook in the Columbia River Basin, including those returning to the Snake River, have been managed as separate stocks. Historical databases, therefore, provide separate estimates for the spring and summer chinook components. Table 1 reports the estimated annual return of adult, natural-origin Snake River spring and summer chinook salmon returning to Lower Granite Dam since 1979.

NOAA's National Marine Fisheries Service (NOAA Fisheries) set an interim recovery level for Snake River spring/summer chinook salmon of 31,400 adults at Ice Harbor Dam in its proposed recovery plan (NMFS 1995). The Snake River spring/summer chinook salmon ESU consists of 39 local spawning populations (subpopulations) spread over a large geographic area (Lichatowich et al. 1993). The number of fish returning to Lower Granite Dam is therefore divided among these subpopulations. The relationships between these subpopulations, and particularly the degree to which individuals may intermix is unknown. It is unlikely that all 39 are independent populations per the definition in McElhany et al. (2000), which requires that each be isolated such that the exchange of individuals between populations does not substantially affect population dynamics or extinction risk over a 100-year time frame. Nonetheless, monitoring the status of subpopulations provides more detailed information on the status of the species than would an aggregate measure of abundance.

Table 1. Estimates of Natural-Origin Snake River Spring/Summer Chinook Salmon Counted at Lower Granite Dam, 1979-2001 (Speaks 2000; Nez Perce Tribe 2002).

Year	Spring Chinook	Summer Chinook	Total
1979	2,573	2,712	5,285
1980	3,478	2,688	6,166
1981	7,941	3,326	11,267
1982	7,117	3,529	10,646
1983	6,181	3,233	9,414
1984	3,199	4,200	7,399
1985	5,245	3,196	8,441
1986	6,895	3,934	10,829
1987	7,883	2,414	10,297
1988	8,581	2,263	10,844
1989	3,029	2,350	5,379
1990	3,216	3,378	6,594
1991	2,206	2,814	5,020
1992	11,285	1,148	12,433
1993	6,008	3,959	9,967
1994	1,416	305	1,721
1995	745	371	1,116
1996	1,358	2,129	3,487
1997	1,434	6,458	7,892
1998	5,055	3,371	8,426
1999	1,433	1,843	3,276
2000	3,029	2,299	5,328
2001*	40,000	5,000	45,000
2002*	24,300	4,800	29,100
		Recovery Escapement Level	31,440

*pre-season

Seven subpopulations have been used as index stocks for the purpose of analyzing extinction risk and alternative actions that may be taken to meet survival and recovery requirements. The Snake River Salmon Recovery Team selected these subpopulations primarily because of the availability of relatively long time series of abundance data. The Biological Requirements Work Group (BRWG 1994) developed recovery and threshold abundance levels for the index stocks, which serve as reference points for comparisons with observed escapements (Table 2). The threshold abundances represent levels at which uncertainties (and thus the likelihood of error) about processes or population enumeration are likely to be biologically significant, and at which qualitative changes in processes are likely to occur. They were specifically not developed as indicators of pseudo-extinction or as absolute indicators of "critical" thresholds. In any case, escapement estimates for the index stocks have generally been well below threshold levels in recent years (Table 2).

In 2000, the final aggregate count for upriver spring chinook salmon at Bonneville Dam was 178,302. This is the second highest return in 30 years (after the 1972 return of 179,300 adults). Although only a small portion of these fish were natural-origin spring chinook destined for the Snake River (5800), the aggregate of natural-origin Snake River spring chinook salmon is substantially higher than the contributing brood year escapements (comparable returns to the Columbia River mouth in 1995 and 1996 were 1,829 and 3,903, respectively). The 2000 count for the upriver summer chinook salmon stocks was 30,616. Only a small portion (2000) were natural-origin fish destined for the Snake River. The return of natural-origin fish compares to brood year escapements in 1995 and 1996 of 534 and 3,046 and is generally lower than the average returns over the last 5 years (3,466).

The probability of meeting survival and recovery objectives for Snake River spring/summer chinook under various future operation scenarios for the hydrosystem was analyzed through a process referred to as Plan for Analyzing and Testing Hypotheses (PATH) (Marmorek and Peters 1998). The scenarios analyzed focused on status quo management, and options that emphasized either juvenile transportation or hydro-project drawdown. The PATH also included sensitivity analyses to alternative harvest rates and habitat effects. The PATH estimated the probability of survival and recovery for the seven index stocks using the recovery and escapement threshold levels as abundance indicators. The forward simulations estimated the probability of meeting the survival thresholds after 24 and 100 years.

A 70% probability of exceeding the threshold escapement levels was used to assess survival. Recovery potential was assessed by comparing the projected abundance to the recovery abundance levels after 48 years. A 50% probability of exceeding the recovery abundance levels was used to evaluate recovery by comparing the 8-year mean projected abundance. In general, the survival and recovery standards were met for operational scenarios involving drawdown, but were not met under status quo management or for the scenarios that relied on juvenile transportation (Marmorek and Peters 1998). If the most conservative harvest rate schedule was assumed, transportation scenarios came very close to meeting the survival and recovery standards.

Table 2. Estimated number of natural-origin adult spawners plus recovery levels and BRWG Threshold Abundance Levels for the seven Snake River spring/summer chinook salmon index stocks (NMFS 2000).

Brood year	Bear Valley	Marsh	Sulphur	Minam	Imnaha	Poverty Flats	Johnson
1979	215	83	90	40	238	76	66
1980	42	16	12	43	183	163	55
1981	151	115	43	50	453	187	102
1982	83	71	17	104	590	192	93
1983	171	60	49	103	435	337	152
1984	137	100	0	101	557	220	36
1985	295	196	62	625	641	341	178
1986	224	171	385	178	479	233	129
1987	456	268	67	342	401	554	175
1988	1,109	395	607	306	504	765	332
1989	91	80	43	197	134	237	103
1990	185	101	170	146	84	518	141
1991	181	72	213	116	70	488	151
1992	173	114	21	10	73	524	180
1993	709	216	263	149	362	785	357
1994	33	9	0	16	52	189	50
1995	16	0	4	26	54	73	20
1996	56	18	23	213	143	127	49
1997	225	110	43	134	153	228	236
1998	372	164	140	118	90	348	119
1999	72	0	0	91	56	138	49
2000*	58	19	24	240	647	280	102
Recovery Level	**900**	**450**	**300**	**450**	**850**	**850**	**300**
BRWG Threshold	**300**	**150**	**150**	**150**	**300**	**300**	**150**

Spring chinook salmon index stocks: Bear Valley, Marsh, Sulfur, and Minam. Summer-run index stocks: Poverty Flats and Johnson. Run-timing for the Imnaha stocks is intermediate.

* pre-season estimate

For the Snake River spring/sum mer chinook ESU as a whole, NOAA Fisheries estimates the median population growth rate (lambda), from 1980-1994, ranges from 1.012 to 0.796 (Table 3), depending on the assumed success of hatchery fish spawning in the wild. Lambda decreases with increasing success of instream hatchery fish reproduction, compared to fish of wild origin (Tables B-2a and B-2b in McClure et al. 2000). NOAA Fisheries estimated the risk of absolute extinction for the aggregate Snake River spring/summer chinook population to be zero in 24 years regardless of hatchery fish reproduction, and from 0.00 to 1.00 in 100 years, depending on the success of instream hatchery fish reproduction (Table 3). This analysis period does not include the higher returns observed since 1996. Since 1996, the average proportional increase in hatchery fish compared to wild fish has been substantially greater, consequently, even though the number of recruits per spawner has increased for natural fish since lambda was calculated, the estimate of lambda for natural fish may actually decline from the values in Table 3, due to the disproportionate increase in hatchery fish.

Table 3. Annual rate of population change (λ) in Snake River Spring Chinook salmon, absolute risk of extinction (1 fish/generation), and risk of 90% decline in 24 and 100 years for the period 1980-1994†. The range of reported values assumes that hatchery-origin fish either do not contribute to natural production or are as productive as natural-origin spawners.

Model Assumptions	l	**Risk of Extinction**		**Probability of 90% decrease in stock abundance**	
		24 years	100 years	24 years	100 years
No Correction for Hatchery Fish	1.012	0.00	0.00	0.014	0.072
No Instream Hatchery Reproduction	0.964	0.00	0.04	0.002	0.914
Instream Hatchery Reproduction = Natural Reproduction	0.796	0.00	1.00	0.996	1.000
† From Table B-2a and B-2b. Cumulative Risk Initiative. September 5, 2000, revised appendix B (McClure et al. 2000).					

2. <u>Lower Snake River Subbasin (17060110)</u>

Information on spring/summer chinook salmon distribution, important watersheds, and conditions and trends in the Lower Snake River from the confluence of the Clearwater River (river mile (RM) 139.3) to the confluence of the Salmon River (RM 188.2) is summarized from the Lower Snake Subbasin Biological Assessment (BA) (BLM 2000a).

a. Species Distribution:

Spring/summer chinook salmon use the mainstem Snake River for upstream and downstream migration and, to a limited extent, juvenile rearing. Migrating adult salmon may use the Snake River for staging prior to migrating to natal streams to spawn. Accessible tributary streams are used for spawning and/or juvenile rearing when stream conditions are suitable. Asotin Creek is the only tributary stream that is currently used for spawning and rearing by chinook salmon. Juvenile rearing may occur at the mouth or lower reaches of accessible tributary streams. The Snake River has elevated summer water temperatures that are sub-optimal for rearing, but tributary streams often provide cool water refugia for juveniles. These tributary streams may have low water barriers, but are accessible during high spring flows. Low numbers of rearing juvenile chinook salmon may be found in the lower reaches of larger tributary streams. Other smaller accessible tributaries may also be used if stream conditions are favorable.

b. Location of Important Spawning and Rearing Areas:

Asotin Creek is an important spawning and rearing watershed for spring/summer chinook in the Lower Snake River Subbasin. Historically, other larger tributaries within the subbasin (i.e., Captain John Creek) may have been used for spawning and rearing. Priority watersheds identified for spring/summer chinook salmon include Asotin and Captain John Creeks.

c. Conditions and Trend of Populations:

The Bureau of Land Management (BLM) (2000a) noted that current numbers of naturally spawning spring/summer chinook salmon in the Lower Snake River Subbasin are at all time lows, and the overall trend is downward. Asotin Creek is the only tributary stream that is used by chinook salmon for spawning. Current use of Asotin Creek by spring/summer chinook is at very low levels and does not have a stable return of adults.

3. Lower Salmon River Subbasin (17060209)

Information on spring/summer chinook salmon distribution, important watersheds, and conditions and trends in the Lower Salmon River from its confluence with the Snake River upstream to French Creek (RM 104.8) is summarized from the Lower Salmon River Subbasin BA (BLM 2000b), except where noted.

a. Species Distribution:

Spring/summer chinook salmon use the mainstem Salmon River for upstream and downstream migration and, to a limited extent, juvenile rearing. Migrating adult salmon may use the Salmon River for staging prior to migrating to natal streams to spawn. Accessible tributary streams are used for spawning and/or juvenile rearing when stream conditions are suitable. Slate Creek and White Bird Creek are the only tributary streams that are currently used for spawning and rearing. Stray adult chinook salmon may be found occasionally in other tributary streams (i.e., John Day Creek and French Creek). Juvenile chinook salmon rearing may occur at the mouth or lower reaches of accessible tributary streams. The Salmon River has elevated summer water temperatures that are sub-optimal for rearing; therefore, tributary streams may provide cool water refugia for juveniles. Often these tributary streams have low water barriers, but are accessible during high spring flows. Tributary streams that may be used by juvenile chinook salmon for rearing include China, Eagle, Deer, Cottonwood, Maloney, Deep, Rice, Rock, Skookumchuck, John Day, Race, Lake, Allison, Partridge, Elkhorn, and French Creeks. Other smaller accessible tributaries may also be used if stream conditions are favorable.

b. Location of Important Spawning and Rearing Areas:

Slate Creek and White Bird Creek are important spawning and rearing watersheds for spring/summer chinook salmon in the lower Salmon River drainage. Historically, other larger tributaries may have been used for spawning and rearing. Priority watersheds identified for spring/summer chinook salmon within the subbasin include China, Eagle, Deer, White Bird, Skookumchuck, Slate, John Day, Race, Partridge, and French Creeks.

c. Conditions and Trend of Populations:

The BLM (2000b) noted that current numbers of naturally spawning spring/summer chinook salmon in the Lower Salmon River Subbasin are at all time lows, and the overall trend is downward. Slate Creek is the only tributary stream that is used by chinook salmon annually for spawning. White Bird Creek may be used by stray adults on occasion, but such use is expected to be very low.

4. Little Salmon River Subbasin (17060210)

Information on spring/summer chinook salmon distribution, important watersheds, and conditions and trends in the Little Salmon River from its confluence with the Salmon River near Riggins, Idaho upstream to the headwaters is summarized from the Little Salmon River Subbasin BA (BLM 2000c), except where noted.

a. Species Distribution:

Spring/summer chinook salmon occur in the lower portion of the Little Salmon River and its tributaries, downriver from barriers located on the mainstem at RM 24. Streams and rivers providing spawning and rearing for spring/summer chinook salmon include the Little Salmon and Rapid Rivers, and Boulder, Hazard, and Hard Creeks. Mainstem Little Salmon River tributary streams providing potential rearing habitat at the mouth and/or lower reaches only include Squaw, Sheep, Hat, Denny, Lockwood, Rattlesnake, Elk, and Trail Creeks. These streams provide sub-optimal rearing habitat because of steep stream gradients, barriers, and small size of tributaries.

b. Location of Important Spawning and Rearing Areas:

Priority watersheds for spring/summer chinook salmon in the Little Salmon River Subbasin include Rapid River and Boulder, Hazard, and Hard Creeks. These streams provide spawning and rearing habitat for spring/summer chinook salmon. Rapid River is a stronghold and key refugia area for spring/summer chinook salmon.

Rapid River Hatchery was constructed in 1964 to mitigate for fish losses caused by construction of hydroelectric dams on the Snake River in Hells Canyon (Watson 1996). The hatchery is used for adult collection, egg incubation, and rearing of Snake River spring chinook salmon. According to the BLM (2000c), the highest number of intercepted adult natural spawning chinook salmon counted at the Rapid River weir was 1,269 in 1985, and the lowest counted was four in 1997. A total of 42 natural spawning adult chinook salmon were counted in 1998, but only nine natural spawning chinook salmon were counted in 1999.

c. Conditions and Trend of Populations:

The BLM (2000c) noted that current numbers of naturally spawning spring/summer chinook salmon in the Little Salmon River Subbasin are at all time lows, and the overall trend is downward.

5. Middle Salmon River Subbasin (17060207)

Information on spring/summer chinook salmon distribution, important watersheds, and conditions and trends in the Middle Salmon River, which includes the Salmon River face drainages and tributaries from RM 107.2 to RM 187.1, is summarized from the Middle Salmon River and South Fork Salmon River Subbasins BA (BLM 2000d), except where noted.

a. Species Distribution:

Spring/summer chinook salmon use the mainstem Middle Salmon River for upstream and downstream passage. A limited amount of juvenile rearing may also occur in the Salmon River. Spawning and rearing for spring/summer chinook salmon occurs in lower Wind River and

Crooked, Bargamin, Chamberlain, and Horse Creeks. Other accessible tributaries may be used for juvenile rearing when flow conditions and water temperatures are acceptable. Use generally occurs in the mouth area or lower reaches of tributary streams.

b. Location of Important Spawning and Rearing Areas:

Priority watersheds for spring/summer chinook salmon in the Middle Salmon River Subbasin include Bargamin and Warren Creeks. These streams provide spawning and rearing habitat for adult and juvenile spring/summer chinook salmon. Spring/summer chinook salmon juveniles were observed in Warren Creek from the mouth to RM 2.4 (USFS 1998). Raleigh (1995), conducted snorkeling surveys in Warren Creek in late August 1994, and found juvenile chinook salmon in the lower reach only (RM 2.4). Spring/summer chinook salmon may use the mouth area or lower reaches of accessible tributaries such as Carey, California, and Bear Creeks for rearing.

c. Conditions and Trend of Populations:

The BLM (2000d) noted that current numbers of naturally spawning spring/summer chinook salmon in the Middle Salmon River Subbasin are at all time lows, and the overall trend is downward.

6. South Fork Salmon River Subbasin (17060208)

Information on spring/summer chinook salmon distribution, important watersheds, and conditions and trends in the South Fork Salmon River from its confluence with mainstem Salmon River to the headwaters is summarized from the Middle Salmon River and South Fork Salmon River Subbasins BA (BLM 2000d), except where noted.

a. Species Distribution:

Most spring/summer chinook salmon spawning areas within the South Fork Salmon River are found upstream of the confluence of the Secesh River and the South Fork Salmon River. The largest spawning concentration occurs in the Poverty Flats to Fourmile area and in Stolle Meadows.

b. Location of Important Spawning and Rearing Areas:

Concentrated spawning areas for Snake River spring/summer chinook salmon are found in the Glory Hole, Oxbow, Lake Creek, and Dollar Creek areas, the Icehole area in Johnson Creek, and the Secesh Meadows in the Secesh River. Rearing and overwintering occur throughout the South Fork Salmon River.

c. Conditions and Trend of Populations:

Historically, the South Fork Salmon River was the single most important summer chinook spawning stream in the Columbia River Basin (Mallet 1974). Redd counts in the South Fork have declined from 3,505 redds in 1957, to 810 in 1992. The Secesh River and Lake Creek redd counts (combined) were more than 500 redds in 1960 and declined to a low of 10 redds in 1975. Counts of 112 redds in 1991 dropped to 28 redds in 1995 (IDFG 1995). Based on standard transects (IDFG 1992), chinook parr densities are estimated to be less than 15% of potential habitat carrying capacity.

7. Upper Salmon River Subbasin (17060201)

Information on chinook salmon distribution, important watersheds, and conditions and trends in the Upper Salmon River, which includes the Salmon River face drainages and tributaries from RM 187.1 to the headwaters, is summarized from the Biological Opinion on Effects of 2002 Herbicide Treatment of Noxious Weeds on Lands Administered by the Salmon-Challis National Forest (NMFS 2002a), and the Biological Opinion on L3A Irrigation Diversion Modification in the Lemhi River (NMFS 2002b).

a. Species Distribution:

Spring/summer chinook salmon in the Upper Salmon River Subbasin may occur in most of the accessible streams when stream conditions are suitable. Chinook salmon use the mainstem Salmon River for upstream and downstream passage. Spawning and rearing may also occur in the mainstem Salmon River. In addition, most accessible tributaries may be used by spring/summer chinook salmon for spawning and rearing.

b. Location of Important Spawning and Rearing Areas:

Important spring/summer chinook salmon spawning and rearing areas in the Upper Salmon River Subbasin probably occurs in Yankee Fork Salmon, Pahsimeroi River, East Fork Salmon River, Lemhi River, and Pole, Alturas Lake, Valley, and Loon Creeks.

c. Conditions and Trend of Populations:

Compared to the greatly reduced numbers of returning adults for the last several decades, increased numbers of adult chinook salmon returned to the Upper Salmon River drainage in 2000 and 2001. These large returns are thought to be a result of favorable ocean conditions, and above average flows in the Columbia River Basin when the smolts migrated downstream. However, these recent large returns are only a fraction of the returns of the late 1800s. Recent increases in the population are not expected to continue, and the long-term trend for this species indicates a decline (NMFS 2002b).

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